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PROCEEDINGS
OF THE
ROYAL GEOGRAPHICAL SOCIETY
AND
MONTHLY RECORD OF GEOGRAPHY.



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PROCEEDINGS
OF THE
ROYAL GEOGRAPHICAL SOCIETY
AND MONTHLY RECORD OF GEOGRAPHY.

On Matabele and Mashona Lands.

By E. A. MAUND.

(Read at the Evening Meeting, November 24th, 1890.)

Map, p. 64.

AFRICA, with its many fascinations, has monopolised much of the world's attention in 1890. Enterprise has been stimulated into fresh activity. Pioneers as intrepid as those of the sixteenth century have proved the commercial value of the "interior," which has been little better than a dream for the past three centuries. European Powers have carved up the sunny continent and painted its map with their own colours. A library of information has been compiled, and yet I would still draw your overtaxed attention to a region so long fabled as the seat of an ancient splendour and magnificence: the site from which "They fetched gold four hundred talents to King Solomon," which Milton "thought Ophir," where Moorish tradition supposed Sheba's queen ruled in luxury. The secret of this intensely interesting country, with its numerous pre-historic remains, now bids fair soon to be unlocked. Archaeologists are to have a rare treat in solving the oft-disputed problem as to the origin of these extensive ruins. Though stone-lore may prove this ancient and mythical civilisation to have been Phœnician, yet we know that the mediæval Monomotapa or Benamatapa, the modern Matabele and Mashona Lands, was an empire rich in gold when Henry VIII. ascended our throne; whose "Great Lord" ruled many kings from his capital Zimbaoch (probably the ruined Zimbabwe). Experts may now soon piece up a history by excavation, but at best it will be to show us a sad decadence from an ancient civilisation to a modern savagedom. This glorious country of Zambezia—so long speculated on, now speculated in, so oft traversed by our explorers and hunters, the scene of heart-breaking labours by our missionaries—is now being systematically opened up, not by armed intervention, but by the vigorous spirit of commercial enterprise. With the last decade of this century

will begin a new history of civilisation in this famous forgotten land. The British South Africa Company, empowered by Royal charter, will there find employment, homes and riches for thousands of our over-teeming population, and the place of ruins will again become the support of a mighty empire.

Only five years ago Sir Charles Warren's expedition opened up Bechuana-land as a new field for emigration. This has rapidly grown into a thriving Crown colony, supporting an increasing English and Dutch population, and raising large herds of cattle; thus proving how absolutely unreliable previous reports about this country had been.

It has now two fast-growing towns, Vryburg and Mafeking, and a railway quickly constructing, already complete to Vryburg, which will be the trunk line from Capetown to the northern goldfields, having connections eastward, via Malmani and Johannesburg, with Delagoa Bay and Natal, and westward, via Shoshong, with the rich cattle country of Ngami-land, and passing on via the Victoria Falls to the Barotse, who now ask for our protection.

The telegraph has now passed through and beyond Bechuana-land, linking us with many of our adventurous countrymen already settled in the country dominated by the Matabele, so long deemed dangerous of approach.

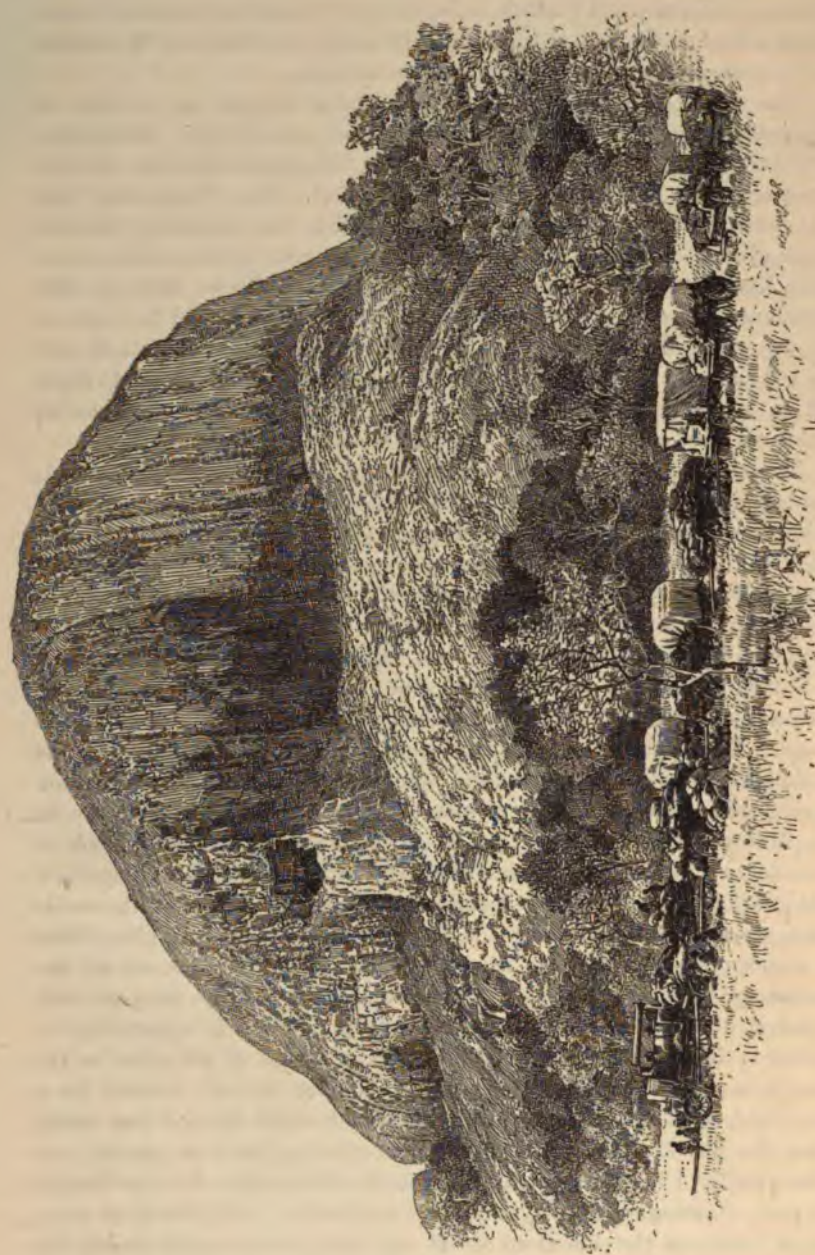
Those of us who have been into that desirable country have always looked upon Bechuana-land as only a stepping-stone to the fairer land beyond; and we must remember that it is no further from our present base than was Kimberley from Capetown when the first diamond was found. This unknown "interior" was long erroneously thought to be fever-stricken and uncolonisable, a delusion which better acquaintance has dispelled, and the discovery of vast gold deposits will sooner or later develop a "rush" that will make light of distance, and that no climatic difficulty will deter. The cost of transport for this new northern gold-field, by the southern trunk line with its narrow gauge, would enormously reduce the profits. We are soon, however, to tap our new colony from the east coast. Beira, at the mouth of the Pungwe river, the route to which has already been prospected, is scarcely more than 250 miles from the mines, 70 miles of which can be done by water. The rest will not take long to connect up by railway. It is needless to demonstrate the advantages of this route over that to Capetown, which is at least 1800 miles. In America, the railway went first, and the development of the country quickly followed. Let us take a leaf from their book.

The principal physical feature noticeable in Bechuana-land and extending to the high veldt plateau of the Matopo range, is a series of vast sand-belts running east and west, varying in breadth from a few thousand yards to 50 miles, and in elevation, the crest above the trough, from a few feet to several hundred. These belts carry good grass and bush with camel-thorn trees, the bush being invariably thickest on the

crest, but necessarily lack a surface water-supply. This marked feature extends, with a few accidental variations caused by the outcropping of granite, limestone, and basaltic hills, probably from Namaqua-land and Damara-land on the west to the Basuto Transvaal and Mashona Mountains on the east, and beyond the Zambezi northwards.

The cause of these mysterious sand-belts suggest a problem in physical geography which must be left to geology to decide. They must have been raised in their present wave-like formation either by the aid of water or by a constant and powerful wind. The theory that this part of Africa was an elevated basin, which has gradually drained Zambeziward, is the most acceptable, as in the greatest depression about Lake Ngami and along the fertile valley of the Chobe there is still abundance of water. The continual washing backward and forward of the water has disintegrated the old red sandstone upper crust, and left the red sand in this formation like, on a small scale, the sand-ridges left on our sea-shore by the receding tide; while the kopjes of granite, which all have one form, stand out like rocks at low water.

These kopjes are rocky hills, with the summits apparently denuded, leaving a flat table-top with short cliff-like edge, the *débris* having fallen in slopes at an angle of 45 degrees, as though crumbled off as the tide fell. Beneath the sand formation is generally to be found a limestone sedimentary crust, which in the Kalahari undoubtedly preserves the water underneath from evaporation. Thus at a fountain near Vryburg, between Motito and Takoon, 20 feet beneath the surface there is a running stream 57 feet deep, doing no good to the soil, simply because it wants man, aided by science, to prevent its thus running to waste. The sandstone conglomerates at Kanje and Molopololi, and the banket formation in Matabele-land, were possibly formed by infiltration during this water age. The results of its energetic action is seen in the Matopo range, where you find hills formed of a single block of granite, looking in the distance like our Downs, but on closer inspection this gentle slope is rounded off and polished by the action of the sand-laden water. Detrition has made it as smooth as the shingle-pebbles on our shores. These hills are a favourite haunt of baboons, as immediately they are disturbed they scamper over the steepest and roundest hills, where you cannot follow them. There is apparently no glacial actions, but *moulins* I have frequently found of all sizes in the smooth surface, often with the rounded boulder *in situ*. Indeed, for a long time, until I found them large and the boulder there, I had taken them for old Mashona mills, either for crushing corn or quartz, and subsequently I found these people do utilise the smaller for the former purpose. Geologists now by a closer examination will doubtless come across fossils in the limestone crust and sand, which will decide the question as to there having been a large lake since dried up, or one gradually run off, owing to a breach having been made through the



THE PIONEER EXPEDITION ON "TREK" PAST A KOPJE.

outer rim by some convulsion where the Zambezi now flows out. This lake theory was a favourite speculation of Livingstone.

With regard to the vegetation being thickest on the crest of the belts, I can only suggest that whatever moisture falls, quickly finds its way to the valleys; consequently the grass grows more luxuriantly there. The grass in these valleys, after good rains, is often 4 to 6 feet high, and, as the natives yearly burn the grass when it is driest, it naturally follows that the fire is fiercer in the bottoms than over the crest, where grass is sparse from lack of moisture. Bush and trees perish in the dells, but live through the ordeal above, and often ultimately become so thick as to be impenetrable.

It is on the high veldt among the Mashona hills that the rich reefs lie, once so well worth working in pre-historic times, as is evidenced by the old workings to be found all over the country; while the rich watered valleys, from whose streams the natives now wash their quills-full of gold, are capable of raising crops and feeding cattle for the support of a large European population.

Before going into details I would draw your attention to the map of Matabele-land and Mashona-land. It practically lies between the parallels of 16° and 22° S. lat. and the meridians of 27° to 33° E. long., and is certainly the most promising country for colonisation in South Africa. Compared with the country south of it, Matabele-land is like Canaan after the wilderness. Lying high, generally healthy, and very rich in minerals—gold, copper, and iron having been extensively worked by the ancients with their rude appliances. Its numerous rivers are either running, or have plenty of water in them. The soil is rich and admirably adapted for corn; cattle thrive, and there is an abundance of grass and wood. White children can be reared in the country, which is a *sine quâ non* if it is to be successfully colonised by white men; and, above all, it is sparsely populated.

The country dominated by the Matabele is nearly as large as Germany, while the territory actually occupied by them is very small, and would compare about as Bavaria does to the German Empire. Their kraals occupy the plateau forming the water-parting between the Zambezi and the Crocodile rivers. They are a Zulu military organisation, occupying a rich country which they have depopulated, and live under a despotism of the worst kind. The population may be estimated at about 150,000, and has, from the incorporation of conquered elements, become a mixed people of Zulus, Bechuanas, Mashonas, and Makalakas. Their fighting strength is probably not over 14,000 to 15,000 men.

It is unnecessary here to dwell upon the history of the Matabele nation, which has been one of bloodshed since their exodus from Zulu-land under 'Mzilikazi about 1822; it was sixteen years later that they occupied Matabele-land. The terror of their assegais reaches beyond the Zambezi, while witchcraft claims many a victim amongst their kraals.

Of their government little can be said, except that everything centres in the King. The secret of his power is on Louis XIV.'s principle, "*L'état, c'est moi.*" Everything is reported to him, from the death of a calf to the defeat of an impi. Their laws principally relate to witchcraft. One, however, relating to marriage, I am informed, many a married man in England would envy, namely, that mothers-in-law may not enter their son-in-law's house, and, should they meet in the street, they must avert their gaze.

The Matabele, however, have very much improved of late years, and I attribute it to their greater intercourse with white men, through their seeking work at the diamond and gold mines. There has been less raiding, though this will never cease until their organization is destroyed.

King Lo Bengula is by no means so black as he is painted (I mean in character). I must differ from those who say he is "deadly cruel." We must not judge him by our standard. He has to rule a turbulent people, who do not know the value of life. He is shrewd, possesses a wonderful memory, and has sufficient intuitive knowledge to despise many of the superstitions, of which, as rain-maker, he is the chief exponent. Speaking one day to me of killing, he said, "You see, you white men have prisons, and can lock a man up safely. I have not. What am I to do? When a man would not listen to orders, I used to have his ears cut off as being useless; but whatever their punishment, they frequently repeated the offence. Now I warn them—and then a knobkerried man never repeats his offence." This, for a savage, was fairly logical. It may appear to us cruel; but remember how short a time it is since we hanged for sheep-stealing, and certainly the savage execution with the knobkerrie is not so revolting, and is less painful, than a civilised execution refined with electricity. A blow on the back of the head, and all is over. Lo Bengula is very hospitable to white men, and likes them always about him. He is, in my opinion, much more adapted to a farmer's life—being very fond of his cattle—than to ruling the crew he does. As a young man, he was a keen sportsman, but is now too grossly fat to get on a horse. Though his head kraal has the sinister name of "Gubulawayo," or the "place of killing," yet all that sort of thing has much toned down, and one sees little of such horrors. Lo Bengula is far too refined to ornament the approach to his kraal with human heads, as chiefs do further removed from civilisation. Notwithstanding all the malicious reports to the contrary, the king and people have kept to their promises of friendship to the English, and acted up to their engagements.

I first made Lo Bengula's acquaintance in 1885, when I was sent by Sir Charles Warren with Lieut. Haynes to advise him to keep on friendly terms with Khama, our ally, the chief of the Bechuana. In the next few years, after the craze in South Africa on the discovery of

gold at the Randt, poor Lo Bengula was overwhelmed with concession-seekers. When I revisited him at Gubulawayo in 1888 in a private capacity, he sent for me one morning, and after confiding to me his fears of the Boers and Portuguese, and the doubts his people entertained of the power of England after the defeat at Majuba, asked me if I would take a letter from him and accompany two of his head men to England, to see if the White Queen still lived. These envoys, he said, would be "his eyes, ears, and mouth." Though I hesitated at first, I accepted the mission, and next day we started down country—Mr. Colenbrander (the interpreter), two naked old coloured men, that is the envoys, and myself. We gradually dressed the ambassadors on the road. I took them through the Transvaal, partly that they should be able afterwards to compare Boer power with our own, and partly owing to scarcity of water on the other route. By the time we arrived at Capetown, the two envoys apparently became devoted to clothes and delighted with civilisation. What struck them most at Cape Town was the houses, reared story above story, and the juvenile wax figures in a clothier's window, which they refused to look at, and could not be induced to believe were other than dead children on show before burial. On the passage to England they were never either sea-sick or home-sick, and enjoyed the voyage in what they called the floating kraal immensely. Soon after landing, through the kind efforts of Lady Frederick Cavendish and Lord Lothian, we went down to Windsor, and they saw the White Queen, who thoroughly won their hearts by her gracious reception. After a month spent in England, during which time they had ample opportunities of seeing England's greatness (for the authorities did all they could to impress them) we returned to the Cape.

On landing, one of these old men (their ages were 65 and 70, or older) showed signs of failing, and I feared I should not get him back to his home. However, in July last year, we arrived safely with the letters and presents in Matabele-land, being received on the frontier with mystic witchcraft rites to impress the nation. For months afterwards long palavers went on, and these old fellows gave the most minute descriptions of all they had seen, and very clever were many of their illustrations. Thus, describing the sea to the Indunas, they said it was like the blue vault of heaven at noon, and the floating kraal was as the sun in the centre; the water was mostly thus calmly blue, the kraal being pushed through it by its steamer (engine) from behind. The sapient remark of Lo Bengula was, "How could such a vast iron kraal be sustained by the water, unless it had supports from the bottom, by which it was pushed along? Truly these 'Makeeweh' (white men) are the sons of the sea." Sometimes, the old men added, the sea was "full," i.e., like their boisterous rivers in the rainy season; then, the floors and roofs of the kraal rocked till the white men danced. This rough sea was soon after passing the Portuguese gate (Lisbon), and refers to a gale in

the Bay of Biscay : but they could not understand how the Queen allowed the Portuguese to have a gate on her water leading to Capetown. London they described as the place all white men must come from ; people, people everywhere, all in a hurry, serious of face, and always busy like the white ants. There was not room for every one above ground in this great kraal, for they could see men and horses moving in a stage below, just as they live in houses built one above the other (this referring to Holborn Viaduct). The fire-carriages, too (train), like those between Kimberley and Capetown, have to burrow in the earth under the streets for fear of being stopped by the crowd. The sham fight at Aldershot they described very minutely, and, in my hearing, old Babiaan, turning round to about thirty Indunas, said, "Never talk of fighting the white man again. Aough ! They rise up line after line, always firing. Their little boys, the sons of head men, all learn to fight like men (referring to Eton boys). Their generals corrected all faults ; they won't pass a man who is out of time as they dance by in line coming from the fight (the march past)." Many a laugh we had over curious but always intelligent descriptions of their recollections. Above all, the interview at Windsor most impressed them, and the sight of Cetewayo's assegais in the corridors of arms there.

They told us they could see that all the kings and queens at Madame Tussaud's were those whom our present Queen had conquered, because last, and downstairs, came Cetewayo—and was not his assegai at the end of the corridor ? This idea we did not think it necessary to correct.

Much more could I tell you of their sayings, but the great result of their visit is what we should appreciate. I have no hesitation in saying that the recent peaceable occupation of Mashona-land by our party of pioneers is the direct outcome of the clever way in which these two old men told their tale, and the King disseminated it among his people.

The Queen did more good for the Empire by that kindly interview at Windsor, than could have been done by thousands of her soldiers. Had the same policy been followed in Zulu-land, how much trouble, how many brave lives, and what vast expenditure, might have been saved ! For the Zulu is our natural ally in South Africa—he admires us for our athletic tastes, manliness, and pluck.

Before I left Matabele-land this year, Lo Bengula had sanctioned the construction of a road by the Chartered Company to Mount Hampden, at the sources of the Mazoe, and had permitted two parties of prospectors to work between Bulawayo and Tati, thereby showing his faith in the power of the English, and his determination to act up to his engagements with them.

Let me now state why this country is so well adapted to colonisation. Unfortunately the few Europeans who have lived in what used to be the far "interior," have given us but meagre ideas of its capabilities ;

and some few, on coming down country, have loved to pose as heroes by accounts of the dangers and difficulties they have gone through. This has undoubtedly retarded the development of what we now know to be so profitable a land, capable of relieving our congested home population, and yielding us the much-needed increase of gold to push forward our commercial enterprises.

The country about to be opened up, for colonisation is, as you see, an extensive plateau, on the water-parting between the Zambezi and the Crocodile rivers. There are no great mountain peaks. To the east the slope of the land is abrupt and the country broken, many of the hills isolated and very conspicuous, while to the north-west it falls in gentle undulations. The plateau is furrowed by many considerable rivers, and their numerous tributaries. The climate in these highlands, which vary from 3000 to 5000 feet above sea-level, is far more healthy than the now well-colonised seaboard of South Africa. The seasons are well marked, and the rainfall good. For eight months, from April to November, the air is particularly dry and salubrious, and compares well with the Free State. During, and just after the rains one must be careful, as in all tropical climates. But with proper precautions dwellings placed high and above exhalations from the marshes left by the subsiding rivers, and above all a judicious abstinence from alcoholic drinks, the new mining and farming communities will be as healthy as are the missionaries who have lived so long there with their families.

Here let me pay a tribute to these silent workers, whose genial hospitality and kindly attention in case of sickness is bestowed on travellers throughout Africa. In Matabele-land as elsewhere they have been the pioneers of civilisation. A heartbreaking up-hill work has theirs been for the past thirty years among the truculent Matabele, and though their converts are few, their example is beneficial to whites and blacks alike. They have built comfortable brick houses, laid on water from brooks and springs, and irrigated gardens which show the capabilities of the soil. The King, it is true, is the only one at present who dares copy them; he has a large commodious brick house put up by their builder, he has too an irrigated garden after their pattern. Now, let us hope, their harvest will come, for with the advent of a white population the old order of things will quickly change in Matabele-land. The example of their health will also be an incentive to our countrymen to house themselves as quickly as possible, or we shall have direful stories of fever, simply resulting from a lack of those comforts to which they have been used, and which up here will be a necessity.

During the last rainy season in the months of November, December, January and February, the rainfall in the neighbourhood of Buluwayo amounted to upwards of forty inches. Like all tropical rains they are not continuous, but come in terrifically heavy thunderstorms with hot

sunshine between. At this time the King is very busy with his witch-doctors, rain-making; often painted with medicine charms in bands like a tiger, or making a dreadful concoction called by the traders "hell broth," to please his credulous people, who come to beg rain for their gardens.

The months of September and October, before the rains, are the hottest in the year. All vegetation appears dried up, and the grass lands are burned off by the natives. Cattle grow thin, and are sent off low down the rivers to find grass and water. The natives have, of course, no knowledge of how to store their generous rainfall. In September I have registered a maximum in the shade ranging between 105° and 111° F., but the atmosphere is so dry that it is more easily supported than 85° near the sea coast, where the air is saturated with moisture. The evenings and mornings are delightful, and on this high ground the heat is never enervating. During the winter months, May, June, and July, it is very cold at night in these highlands. Even on the Macloutsie river, at an elevation of 2500 feet, I have registered 15° of frost at night, with the thermometer ranging up to 80° in the day (observed with instruments registered at Kew). Mealies—that is, Indian corn—put in soak for the horses over night, have been frozen hard in the morning.

Notwithstanding this great variation in temperature, the dry season is particularly healthy. What, however, braces the white man withers up the unclothed native. Trek oxen suffer too from this cold, and the dryness of the grass. By these remarks I wish to convey the fact that with ordinary care this country is admirably adapted to colonisation by us Anglo-Saxons. Englishmen have lived up there for the last twenty-five years, and, what is more essential, traders and missionaries have reared large families. There is not the necessity for sending them home as with Indian children. Neither need men, as on the west coast, return home periodically, in order to recruit. Here they may make a permanent home.

The soil all along the rich valleys is very fertile, and large crops of mealies and Kaffir corn, pumpkins, sweet potatoes, tobacco, and even potatoes and tomatoes are grown by the natives, the two latter by the Makalakas. Sowing goes on in October and November, and after the first rains it is marvellous to note the rapidity with which the grass and corn grow. The country changes its russet-burnt garb as if by magic to one of emerald green, and grass land and forest are ablaze with flowers. Harvest time is in May and June, and much of the corn is soon turned into Kaffir beer—the national drink. There is a great future in the corn, as also in the cattle trade, for this country. Kaffir corn was traded last year for 5*s.* worth of goods per sack. As before stated, the rains are so heavy that they run off quickly into the lower reaches of the rivers, and in beds too deep to lead off the water, except at great

expense; but by judicious storage of this rain supply, vast tracts might be irrigated. Springs are numerous, and only want opening up.

As an illustration of what can be done with this deep alluvial soil, I will instance a garden at Shiloh where Mr. Thomas, a missionary, now dead, led on the water from a spring. From it last year I reaped and threshed several sacks of English wheat, and got a very good crop of potatoes. Cabbages, carrots, onions, marrows, beans, peas, cucumbers, tomatoes, and lettuce also thrive well. In fact, all English vegetables, as well as sweet potatoes and mealies, grew very quickly in this irrigated ground. Almost any fruit seems to flourish. From the same garden we enjoyed large crops of oranges, lemons, figs, bananas (or rather plantains), peaches, apricots, pomegranates, mulberries, and Cape gooseberries. The date palm and apple trees, though growing well, were too young to bear. The orange, lemon, and fig trees grow luxuriantly, and fruit well. There were beautiful groves of them in this missionary's garden. The vines, grown over trellised alleys, bore a great many and very heavy bunches of luscious grapes. The white ant is the gardener's enemy, but, luckily, he seems to prefer the sandy soils to the rich loams.

Great quantities of excellent tobacco are grown by the Mashonas and Makalakas, that coming as tribute from Inyoka being considered the best. It is principally converted into snuff. I bring for exhibition some which I brought home last year, together with Mashona pipes. The outside glaze is nicotine squeezed out in preparing the cones. It is very strong, but, *faute de mieux*, is not bad smoking; we, however, used to wash it in two waters and carefully dry it before smoking. Lo Bengula smokes huge pipes of it all day long. The rice grown in Mashona-land is excellent, and cost last year about 18s. worth of goods per sack, while in Mashona-land it is now less than 12s. a bag, i.e. 230 lbs. We used to buy it from the natives in small bags like this, made out of bark; unfortunately, weevils have got into this sample. Cotton and indiarubber we know grow in the north, for the Mashonas weave blankets of the former and make candles of the latter. Indigo grows as a weed, and is used by the natives for dyeing purposes. The grass, corn, rice, tobacco, and gardening capabilities of this country are sufficient allurements for farming colonists, while undoubtedly it would produce cotton, sugar, and coffee.

Three scourges farmers have to combat: lung-sickness among cattle, horse-sickness, and the tsetse fly. The first is successfully treated by inoculation. Natives of course do not understand closing infected districts; but under the white man's laws this disease will undoubtedly be stamped out. For horse-sickness a specific has still to be found, and in the presence of the loss to South Africa arising from it, it would assuredly pay to enlist the services of European scientists. The tsetse fly, whose bite is so deadly to domestic cattle, will dis-

appear with the game. The Transvaal, since the game has been so shot out, is now nearly free from this pest. The Mashonas dry and pound the fly, and give it to their dogs, a fly a day, as a safeguard against the effects of it.

Matabele-land is well wooded, though the timber is not large except along the rivers. The mopani, of which there are vast forests, is a hard wood, capable of withstanding white ants, and is useful for building and firewood, while its bark tans excellent leather. I have brought for the inspection of the meeting the skin of a koodoo and pieces of buffalo hide, tanned with it by a native. It is an excellent leather for veldt schoens, as the Boers' understandings are called. Until coal is found nearer than the Zambezi valley, there is a good and sufficient wood supply.

It is to the mineral riches, however, that we must look for the quick development of this country. The gold in Mashonaland, will, I believe, create a rush, only to be paralleled in the development of California and the western states of America. During the seven months I remained with the King after the return of his Indunas, I mapped, and as far as possible prospected, the immediate neighbourhood of his chief kraals. In some of the numerous reefs we found free gold, and old workings were frequently visible. There is, too, in this district a banket formation similar to that in the Transvaal; while north of the Ramaquoban river the Charter prospectors found a body of reef running as much as two ounces to the ton. It is not in this district, however, the Company has begun work; but it is the Mazoe and Hanyani fields which are being carefully explored by a well-organized pioneering expedition. These northern gold-fields have been talked about for twenty years. From these rivers it is that the natives bring gold-dust in quills for sale to the white men. Mount Hampden therefore was made the first objective point of the Company. The King sanctioned the making of a road, which is now open to traffic; while from Fort Salisbury, six miles south of that mountain, the administration of Zambezia has begun, and a township is springing up. The journey thither, under the able command of Col. Pennefather and Sir John Willoughby, gives us some new geographical facts, which I am able to communicate to you to-night. It is far more satisfactory to be able to fill in a map with known physical features than simply to paint it with a proprietary colour.

Passing out of Khama's country, the British South Africa Company's expedition found a fair agricultural country, rising only 500 feet in the 150 miles between the Tuli and Lundi. The former river is 400 yards wide at the drift. Half a dozen new rivers, whose euphonious names I need not trouble you with, are reported as running south-east to the Crocodile. At first the road led through a bush and mopani feldt, while the latter 90 miles consists of grazing flats interspersed with granite and sandstone kopjes. It is sparsely populated by Makalakas and Banyai who are tributary to Lo Bengula.



THE RUINS ON THE LUNDI RIVER.

After the Lundi, the elevation gets sharper and the country more difficult; there is a rise of 1500 feet in less than 65 miles to the top of the Providential Pass, the only apparent pass (and that 8 miles long) leading from the low to the high veldt. At the Inkwe (? Tokwe) the height above sea-level is 2700 feet. This is a rapid river with water 50 yards wide and 3 feet deep, even in the dry season. The formation here changes from granite to slate, and the gold indications are very good. We are now among the ancient workings of Benamatapa, Monomotapa, or Quitave. Twelve miles east in the mountains are the grand ruins of its ancient capital, Zimbabwe, or Zimbae. The many and vast remains of ancient buildings all point, from their propinquity to old workings, to an extensive gold industry, when the means of extraction were crude as compared with modern appliances. The country gradually rises into an undulating plateau ranging from 4500 to 5100 feet above sea-level, with park-like scenery, the eastern edge breaking away into rocky gorges, supplying many tributaries to the Sabi. The water-parting between this river and the Zambezi's tributaries is often very narrow, 100 yards would sometimes only separate the streams running to the two basins. There are apparently no inhabitants on this plateau south of the Hanyani, so cruelly have Matabele assegais done their work.

The bush is thick and the land boggy at the head waters of these rivers, but beyond the Umfuli there are plains from which Mount Hampden rises, stretching away to the head waters of the Mazoe. The neighbourhood of Fort Salisbury is well wooded, and the petty tribal chiefs welcomed the English force, as promising them security. Prospectors are reporting favourably from all directions, and find old workings wherever they go.

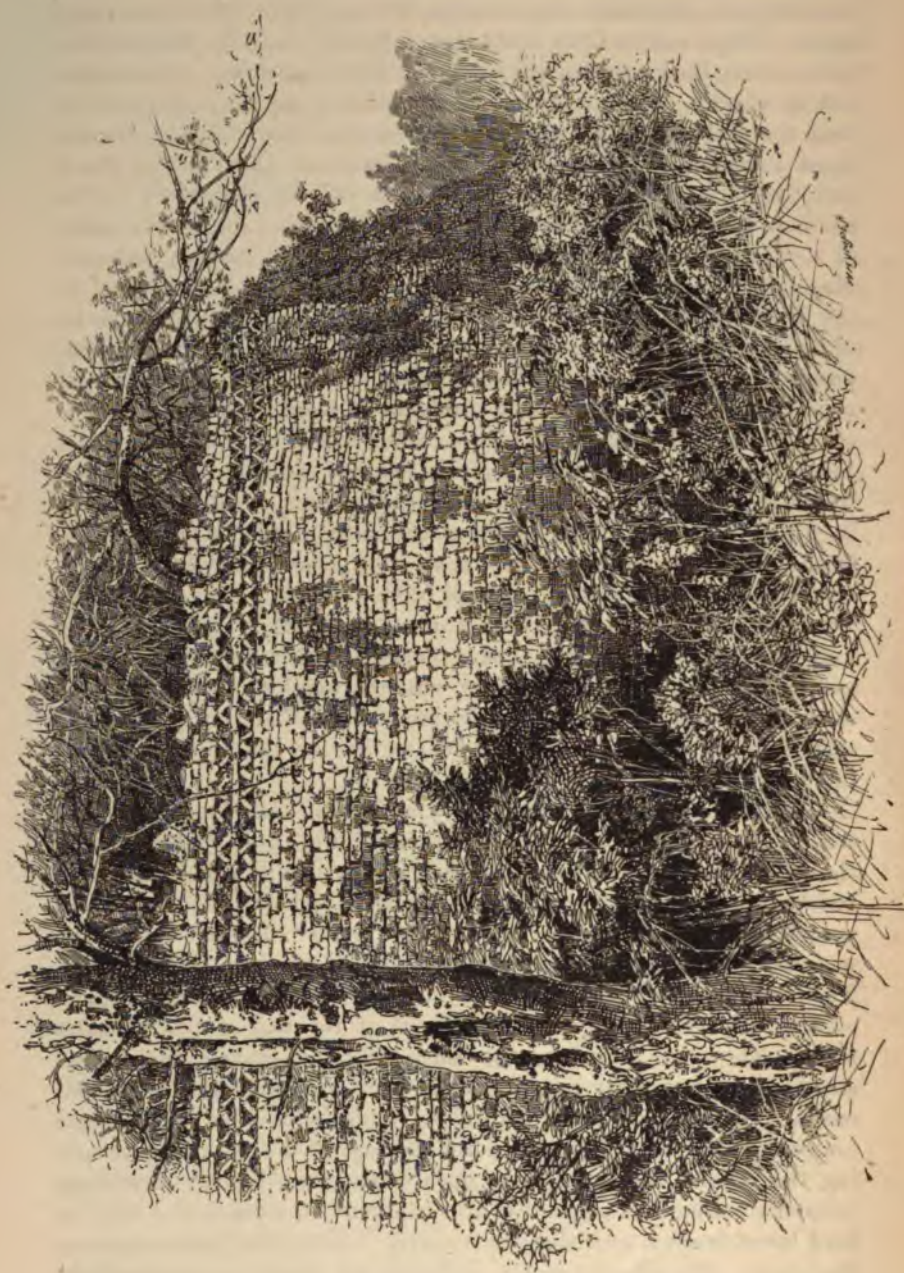
There will be no lack of labour, for numbers of natives, who yearly go south to work will gladly save themselves the 800 miles' tramp, and work in the mines nearer home. The Makalakas and Mashonas, the earlier inhabitants of the country, though physically much inferior to their masters, the Matabele, are clever and willing workers. They fashion the iron, in which mineral the country is particularly rich, into a variety of objects, axes, knives, hoes, beads—principally, however, at present into assegais. When once the Matabele learn the benefits and freedom to accrue from the white man's rule, they will soon, I believe, work as well as their kinsmen, the Zulus of Natal. If, however, they will not change the assegai for the pick and the plough, then gradually they will disappear beyond the Zambezi before the inevitable march of civilisation, and from the down-trodden Mashonas and Makalakas we shall find plenty of labour for both mines and fields.

It is strange that this country, so long fabled as the land of Ophir, and of which Baines and Mauch gave such accurate reports more than twenty years ago, should so long have baffled our colonising instincts.

With regard to these extensive ruins—not only at Zimbabwe, but all

over the country—which have so long puzzled the curious from their inaccessibility, the mystery surrounding their origin is now soon to be cleared up by competent archæologists, who are going out to investigate them. There can be little doubt that they were built for the smelting, and possibly the protection and storage of gold, copper, and other metals; but by whom? I hear one competent authority say they are probably, from the style of building, Phœnician, another that they are Persian. Some Portuguese manuscripts and maps attribute them to the Moors, and they are certainly similar in style to old Moorish work in the northern hemisphere. There is, however, a Spanish manuscript account of a voyage to Malabar and the coast of Africa by Barbosa, cousin of Magellan, composed by himself in 1514 (translated and published by the Hakluyt Society) in which he says:—"On entering this country of Sofala there is the country of Benamatapa, which is very large and peopled by Gentiles whom the Moors call Cafers. These are brown men. . . . They carry swords in scabbards of wood bound with gold or other metals. They are men of war, and some of them are merchants. Leaving Sofala for the interior of the country, fourteen days' journey from it, there is a large town of the Gentiles which is called Zimbaoch, in which the King of Benamatapa frequently dwells, and from there to the city of Benamatapa there are six days' journey, and the road goes from Sofala inland towards the Cape of Good Hope. And in the said Benamatapa, which is a very large town, the King is used to make his longest residence; and it is thence the merchants bring to Sofala the gold which they sell to the Moors, without weighing it, for coloured stuffs and beads of Cambay, which are much used and valued amongst them, and the people of the city of Benamatapa say this gold comes from further off towards the Cape of Good Hope."

This old evidence conclusively proves that the Portuguese had nothing to do with the erection of these buildings. It shows too that the Moors had not then occupied the country. Why should not these brown Gentiles, with their partial civilisation and splendour, have been a decayed remnant of some old Phœnician State? Let the experts tell us. As I have said, these ruins are always found near gold workings. The buildings are all similar, though some are more substantial than others. I have carefully examined those at Tati and on the Impakwe river. They are built in the same way, of granite hewn into small blocks, somewhat bigger than a brick, and put together without mortar. In the base of both of these there is the same herring-bone course as at Zimbabye, though nearer the base of the wall. On removing the rubbish inside we came upon what were evidently three large circular roasting floors, some five feet in diameter, formed of a kind of hard burnt fireclay, and slightly concave. There were also remains of slag about. The remains on the Impakwe are similar in construction, and are within fifty yards of the river. It was evidently an octagonal



THE RUINS OF ZIMBABWE.

tower. On the ground was a similar roasting floor, and there is much slag about, though I failed to find any quartz. The place was evidently divided up by party-walls. Mr. George Phillips, who was with Mauch when he discovered Zimbabwe told me this morning, that when he examined this ruin at Impakwe more than twenty years ago, the walls were then much higher; but it is a regular outspanning place, and is getting destroyed. On searching it then, he found beneath the débris a fire-clay pipe, about 18 inches long, with a thin bar of much oxidised copper in it.

Zimbabwe was discovered by Mauch in 1871. The ruins then were about 30 feet high, and the walls from 10 feet thick at the base to 7 feet on the summit. There were, too, stone beams projecting 10 feet from the wall, which were ornamented with a pattern of lozenge-shaped figures, separated by horizontal zigzag lines. You have recently read accounts of their great extent, and in the photographic slide I now show you see the walls with the herring-bone course near the summit. The ruins on the Lundi river may be those of Benamatapa, spoken of by Barbosa.

The description of these ruins given by Mauch, and now confirmed by the Charter's pioneers, agrees in many particulars with those given to the English public in Shakespeare's day. Purchas, in his 'Pilgrimage,' printed in London 1614, describing Benamotapa, says:—

"But to returne (and who will not returne) to the mines: There are other mines in the provinces of Boro and Quitieni, in which and in the Rivers is found Gold not so pure. The people are carelesse and negligent to get, and the Moores which traded with them, were faine to give wares in trust, with promise by such a time to pay them in Gold, and the people would not guile in their word

"Other mines are in Toroa, wherein are those buildings which *Barrius* attributeth to some forren Prince, and I, for the reasons before alledged, to *Salomon*. It is a square fortresse of stone; the stones of marueilous greatnesse, without anie signe of mortar or other matter to ioyn them. The wall fise and twentie spannes thicke, the height not holding proportion. Ouer the gate are letters, which the learned Moores could neyther reade nor know what letters they were. There are other buildings besides of like fashion. The people call them, the Court, for an Officer keepes it for the Benamotapa, and hath charge of some of his women that are there kept. They esteeme them beyond humane power to build, and, therefore, account them the workes of Deuils; and the Moores which saw them said the Portugals Castles were no way to bee compared to them. They are fise hundred and tenne miles from Sofala, Westward, in one-and-twentie degrees of Southerly Latitude, in all which space is not found one building Ancient or later; the people are rude, and build cottages of Timber."

Heylin, in his 'Cosmography,' published in 1656, gives a similar description, adding, they were "perhaps the work of some of the Æthiopian or Abassine Emperours when their power and Empire was at the highest." While Purchas suggests the "hieroglyphics" were "the old Hebrew Letters, which the Phœnicians of olde, and Samaritans to this day observe."

Millar, in his 'System of Geography,' published in 1782, also gives a
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graphic account of the ruins, and speaks of the characters written over the gate. These, let us hope, our archeologists will soon be able to unearth and decipher, for they would probably be the key to a long lost history. For three hundred years, then, we have had very accurate descriptions of these ruins. And so far from the Portuguese having had anything to do with them, we are distinctly told "the Portugals Castles were no way to bee compared to them."

It is also evident that these buildings were connected with the mining of a people whose history we have lost. It is beside the question whether they were the famed mines of King Solomon, or whether the Queen of Sheba reigned here over a mighty and industrious population. Suffice it for us, that we, with our engines and batteries, are about to make this rich country again disgorge the gold which has so long lain hidden around these pre-historic remains. The work has now begun under the most favourable auspices. The administration of Zambesia is already organised. The gold laws just promulgated give the most liberal terms. Confidence will reign wherever the Chartered Company penetrates. The horrors brought about by liquor saloons among a lawless community will there have no place. Raiding and slavery will cease when once we find paid occupation for the native. Christianity will spread, and peace with prosperity will reign over a region where the most inhuman cruelties have been perpetrated for years.*

* *Note on the Map.*—I would call attention to the great difference in longitude shown on the route from the Macloukie river, an affluent of the Limpopo, to Fort Salisbury to the north. According to Selous, the position of Mount Hampden is about $31^{\circ} 18' E.$, but according to the route map of the expedition of the British South African Co. (which is made the basis of our map), Fort Salisbury is $31^{\circ} 2'$, and being $8\frac{1}{2}$ miles to the S.E. of Mount Hampden, would make the latter about $30^{\circ} 58\frac{1}{2}'$, or about $20'$ to the west of Selous' position. A curious confirmation of the above westerly alteration is given by Mr. Erskine in his journey to Umzila's, 1871-72 (R.G.S. 'Journal,' vol. xlv.), in discussing the position of Zimbabwe (the hill with the celebrated ruins). He says, on p. 45:—"Mr. Mauch's researches place these ruins within 42 miles of my calculated position when at Umzila's kraal, which was determined by several celestial observations by the stars and sun, to be in lat. $20^{\circ} 23' S.$ and long. $32^{\circ} 30' E.$ by dead reckoning; about 25 miles to the east of the Sabi river. I neither heard anything of the ruins after repeated inquiries, nor of Mr. Mauch himself. I am therefore surprised to read in his account that he supposed himself only six days' walk from Sofala; whereas the natives informed me that I was at least eight days' walk distant from Sofala, Mr. Mauch being still to the westward of my position by his own account, i.e. west of the Sabi." On p. 46, Mr. Erskine continues:—"It is my opinion that Zimbabwe is placed by Mr. Mauch at least 30 or 40 miles too far to the east; and that instead of being 164 miles from Sofala, it is distant about 200 nautical miles, as stated by the old geographers." Now the officers of the expedition place Zimbabwe in $31^{\circ} 6' E.$, while on Mr. Erskine's map it is given as $31^{\circ} 40'$, a difference of 34 minutes, which is fairly approximate to the above-mentioned opinion of Mr. Erskine, viz. 30 or 40 miles too far to the east;" and though none of these positions are strictly accurate, yet Mr. Erskine's remarks strikingly confirm the observations of the expedition. Neither Mr. Mauch nor Mr. Selous took any observations for longitude, I believe.—[WILLIAM SHAW, compiler of the map.]

Before the paper,

The PRESIDENT said: In introducing to you Mr. Maund, the reader of the paper to which we are about to listen, I may mention that he was on the staff of Sir Charles Warren in 1885, and by Sir Charles Warren he was sent, with Lieut. Haynes, R.E., to the kraal of Lobengula for the purpose of conferring with that chief and getting him to respect the British protectorate over the chief Khama. In that object he entirely succeeded and obtained eventually great and deserved influence over the mind of Lobengula. From South Africa Mr. Maund transferred himself to North Africa, and there remained for two years. He returned from North Africa and went again into Lobengula's country. By that time, partly in consequence of the reports of Mr. Maund and his colleague, which were published in a Blue-book, there had been a rush of gold-seekers to Lobengula's country, and when Mr. Maund returned he found Lobengula not a little troubled by the many persons who wanted to get concessions out of him. Lobengula then had the happy idea of proposing to Mr. Maund that he should take charge of two of his principal chiefs, take them to England, and present them to the Queen. After some hesitation Mr. Maund accepted this proposal, took the chiefs to England, and did present them to the Queen. They returned and spread in their own country good reports of all that they had seen, and one result of Mr. Maund's efforts, and of those of his companion, has been that Lobengula has thus far been acting not only with the most perfect good faith, but in the most friendly manner towards the British.

After the paper,

MR. THEODORE BENT: I am afraid I cannot give you very much information on the small data I have to go upon, because the photographs we have seen to-night do not give us very many architectural features. At the same time, I am sure I can join with everybody in feeling excessively grateful to Mr. Maund for introducing to us a new feature in African exploration, i.e. that the archæologist has something to do with the South of Africa; and the photographs we have seen are extremely interesting, and if only we can find out the origin of these ruins, I am sure we shall contribute a great addition to archæological lore. In the first place Mr. Maund has spoken of them as possibly Phœnician. Now of course it is a great temptation to talk of Phœnician ruins when there is anything like gold to be found in connection with them, but from my own personal experience of Phœnician ruins, I cannot say that they bear the slightest resemblance whatsoever. In the first place the earliest Phœnicians always built with large stones, and I have seen in the Persian Gulf mounds of blocks of stone of enormous size; passing on into the Mediterranean basin we there get in the earlier Phœnician remains stones of exceeding magnitude and similar masonry; but the Phœnicians, as they progressed in the arts of civilisation, invariably adopted the art of the people with whom they carried on their trade: Greek influence, Egyptian influence, Assyrian influence, and Roman influence so exercised themselves upon Phœnician art, that in the end their art was almost indistinguishable from that of the races with which they carried on trade. They were like ourselves, imitative, fond of trade, carried on commerce, but do not seem to have had the power of originating any artistic devices. Of course it is a speculation, but if it is the Land of Ophir it would be very nice indeed. I like speculations myself immensely, but I think it is the best thing to look upon them with caution. Nine speculations out of ten are wrong, but for the sake of the tenth it is best always to have speculations, and now that Mr. Maund has suggested one or two, I will bring forward my own speculation with regard to these ruins in Mashonaland. He alluded to the fact that somebody said they were Persian. I believe I am the originator of that idea. In the neighbourhood of Zanzibar, some little time ago, Sir John Kirk

found some very interesting ruins, which on comparison turned out to be distinctly of Persian origin. In these buildings he found tiles and fragments of pottery, which correspond exactly with the tiles and pottery which are found in the ruins of Rai and other Persian towns of the Sassanian dynasty in the neighbourhood of Teheran. Of course it is very curious, at any rate, to track the Persians to Africa at all. It seems a very long way to go for your origin, but if you have them in Africa, there is no reason why you should not bring them into Mashonaland; but now before doing this it is necessary to turn to the pages of Persian history. The Sassanian dynasty came to its greatest zenith at the time of Kosroes II., usually called the Conqueror. This man carried his armies all through the then known world. He brought terror into the hearts of the Roman emperors in Byzantium. He turned, as we have it distinctly stated, the Romans out of Arabia and Africa. Furthermore he collected an enormous amount of wealth. His empire was quite the largest the Persians ever had, therefore I think it is not going too far to say that the ruins in Africa, at Zanzibar and the neighbourhood, were probably of the time of the dynasty to which Kosroes II. belonged, and that Kosroes II. was the founder of a Persian empire in Africa.

We will now pass on to consider the photographs that Mr. Maund has placed before us this evening. Architecturally the only point that we could easily distinguish was that geometrical pattern, the course of zigzag round the fort; I have examined one or two other photographs, and these also have geometrical patterns in courses, and of two of these I have photographs of my own, which gives you the exact parallel to those at Rai, near Teheran, in the old ruins which were built in the Sassanian dynasty; hence we seem now rather to have got a clue. This is my theory, and I can only give it for what it is worth, but it really does seem to me that we can reduce ourselves to very narrow limits. Almost immediately after the death of Kosroes II. the Persian empire split up. Before the Sassanian dynasty the Persian empire attempted nothing in the way of exploration in Africa; it was entirely occupied with its own affairs, so that if they are at all Persian, it must be of that dynasty. But of course this theory is open to doubt, and I am perfectly certain that nothing definite will ever be found out about these forts until they are thoroughly dug out and investigated, when perhaps some inscription will be found that will prove that both Mr. Maund and I are quite wrong.

Mr. G. PHILLIPS: I have lived in the country for the last six and twenty years and outlived all the Englishmen who went with me into that district. I consider the paper that Mr. Maund has read this evening perfectly true and accurate; the only thing that I am afraid of is the salubrity of the low part between the Manyami and Umfuli rivers. Next February and March will determine whether Englishmen can live there. Never an Englishman has lived there yet. A few natives entered in 1868, and are still there, and a few in March 1870, the year Lobengula was made king of the Matabele, and are still thereabouts; but since then people have been careful to come out in November and go in again in April and May. When I was at the ruins in October 1871 I heard there were two white men close to the ruins of Zimbabwe in a destitute condition. One of them was Mauch, with an American named Adam Kinders. Mauch told me they had found some ruins like those I had seen. I asked an old man at the ruins when they were built, and he replied they were built when the stones were soft, or so long ago that no one knew anything at all about it. From there to the westward there is a line of these ruins. A few miles distant is another tremendous ruin, with three gateways and walls, I suppose 30 feet thick at the base, and outside are great heaps of ashes, and a few potsherds. One ironwood tree, that would take hundreds of years to grow, had risen through the wall and split it. The most perfect ruin of all, however, is north-west of Tati; it

is a little larger than this hall ; the walls are 12 to 15 feet thick, and it is entered by a passage so arranged as to be commanded by arches from the interior, and it only admits of the passage of one at a time. I came here just to speak, as Mr. Maund had particularly asked me to do so to-night.

The PRESIDENT: We have listened to a very interesting and valuable paper, and I am afraid that as Mr. Maund is still suffering a good deal from the results of his exploration, he has come here at no inconsiderable inconvenience to himself. I shall then, I am sure, take you all with me, if in your name I return to him our most sincere thanks.

Mr. MAUND thanked the meeting for listening so patiently to his paper, and the proceedings terminated.

The Tashkent Exhibition, 1890.

By Captain A. C. YATE.

THE first Exhibition ever held in Asia (India excepted) has been held at Tashkent, the capital of Russian Turkistan during the summer and autumn of this year. The public attention has been so engrossed in Central Africa of late, that Central Asia has had pro tem. to take a back seat. However, it will assuredly come to the front again. Its first Exhibition is interesting, as indicative of the progress Russia is making in Central Asia, where attention is now being paid mainly to the internal development of the country. Internal development may be but a prelude to external extension ; but in the meantime it is obvious that every nation is bound to make its annexations pay. Turkistan and Trans-Caspia have long been, and are still, a burden on the finances of Russia, a country which, from the civilized European point of view, cannot even provide satisfactorily for its own administrative wants, far less afford to maintain a number of impecunious dependencies. Central Asia must be made to pay, and therefore serious efforts are being made to develop its agricultural, manufacturing, pastoral, and mining industries.

The product to which most attention is being paid in Central Asia is cotton. American seed has been largely introduced. The show of raw and manufactured cotton at the Exhibition was very good, the exhibits being arranged with a good eye to effect. Cotton packed in bales for export was seen in large quantities on the wharfs at Uzun-ada, and in course of transit on the railway between Samarcand and Uzun-ada. Mr. Curzon estimates the export of cotton from Central Asia to Russia during 1890 at "over 50,000 tons." The manufactured product of next importance to cotton was wine, light-red and white table wines, which are made at Tashkent, Samarcand, Karakul, &c. These wines are, as a rule, rough and not very palatable ; the principal

exhibitor, however, gave us both white and red wine of fair quality to taste, and the wines and cognac from the Karakul factory (in which General Annenkoff is personally interested) which we tasted at General Annenkoff's table were good. These wines are generally found in the clubs, hotels, restaurants and refreshment-places throughout Central Asia. As regards Central Asian silk, a Corsican exhibitor at Tashkent, (the only foreign exhibitor there, so he said) remarked to me, "*Ce ne sont que des essais.*" Be that as it may, he deemed it worth while to bring his silk-worm eggs, &c., from Corsica to Tashkent. The show of cocoons and raw silk was very effective. The only manufactured silk was that well-known material of native make mostly from Bokhara and Samarcand. The Corsican exhibitor was as anxious to establish a market for his silk-worm eggs in India, as in Turkistan. Having no connection in the trade I could only refer to the French consuls at Indian ports. Besides cotton, silk, and wine, the question of producing sugar is being seriously taken up at Tashkent. I saw the plant (termed "*sorgot*") from which it is to be made in the garden or nursery forming part of the Exhibition. The climate of Tashkent does not suit sugar-cane, but suits "*sorgot*." I was assured that experiments with "*sorgot*" had produced satisfactory results. Other agricultural exhibits of importance were cereals (maize, barley, jowari, &c.), fruits (excellent pears, apples, melons, &c.), rice, vegetables (enormous gourds, and all sorts of European vegetables), castor-oil, &c. The display of European agricultural machinery and implements must have been intended to educate the native. Such articles are as yet no more used in Central Asia than they are in India. Although the Russians have progressed thus far in the production of raw material, they have so far done little or nothing towards the establishment of factories. Almost all this raw material is at present exported for manufacture. There is room for enterprise in this direction. So far wine, beer, and vodka have engrossed the attention of capitalists. Doubtless they have a certain and large sale.

In the mineralogical section I remarked the following products:—iron, salt, lead, sulphur, ozokerit, and last, but not least, coal—this last in at least half-a-dozen varieties. This coal is of great importance to Russia. If the supply of *astatki* from Baku and east of the Caspian fails, this coal must serve to work the railways of Turkistan and Trans-Caspia. Of course, when *astatki* fails, the furnace apparatus on every steamer and locomotive from Batur to Samarcand on the Caspian and on the lower Volga must be altered. The loss of *astatki* will be a serious loss to Russia. Fortunately for them Turkistan produces coal, seemingly in great variety and abundance. The forests of Trans-Caspia do not exist, and those of Turkistan are not of much account at present. The Russians have done a great deal in the way of tree-planting in and around Tashkent, Samarcand, and on a lesser scale at or near most of the cantonments of Turkistan and Trans-Caspia. This tree-culture, however,

rather takes the form of nurseries, than of forest-protection and preservation as carried out in India.

It is as well to point out, because it is not generally known, that the climate of Tashkent and Samarcand is really a very pleasant one, at any rate in spring and autumn. Some months, no doubt, are unpleasantly warm, but nothing to Indian heat. The cold everywhere in winter is excessive. The tract from the Caspian to the Oxus is very warm from May to October. One Russian assured me that 53° Cent. was a common occurrence. This is a higher degree of heat than is known in Upper Scinde in the shade. I have no doubt that Russian was labouring under a misapprehension. He did not seem to recognise the distinction between heat registered in the sun and in the shade.

The next section of the Tashkent Exhibition that merits attention is the stock-breeding one. I thought to see Turkistan cattle, but I only saw Dutch; presumably the Dutch bulls are to improve the local breed. A solitary yak is a very appropriate animal for a zoological garden, but its practical use at the Tashkent Exhibition was not apparent. The show of horses was indifferent, with the exception of two Akhal Teke Turkomans; but even these were not nearly so good as two that were shown to me by a Russian officer at Amu-darya. One of these latter was a real beauty. In writing in 1885 about Turkoman horses, I said that I had never seen a good one, and Sir Peter Lumsden spoke to the same effect later on before the Royal Geographical Society. I had then, however, only seen Merv and Panj-deh horses. I conclude now that the most perfect Turkoman horse is that of the Akhal Teke. As for endurance, the Turkoman is no better than the Arab (if so good), the Herati, and the Karabaghi. It is all a question of training. General Annenkoff has established, or is about to establish, a stud-farm near Amu-darya (Charjui), and has imported a thorough-bred English stallion. The blending of the thorough-bred English and Turkoman strains should produce good stock. Considering the millions of sheep kept by the Turkoman, Kirghiz, Kara-kirghiz, and other nomads, there is a very good opening for an export trade in wool. So far, however, this does not seem to have engaged much attention or capital. The breed of cattle in Central Asia is a very miserable one, while donkeys are large and fine. Mules are rarely seen, but might certainly be bred there as well as in Persia. Small horses and ponies of a certain class abound in thousands and tens of thousands in Turkistan. No man thinks of going to work or to market on foot; the humblest of labouring-men tethers his horse and lets it graze while he works; he rides to and fro between his home and the scene of his labour. Camels there are in similar thousands. Evidently there is no want of transport in Central Asia. Among the exhibits were two local carts; the larger one had wheels about 6½ feet in diameter, and the same apart. It is drawn by one pony, carries about 800 lbs., stands any sort of road, and has wheels

made of a single bough bent into a circle and seasoned. These carts are now found in large numbers in Baku.

It is not necessary here to enter into any details about the numerous native products of the Exhibition, as these are not likely to influence much the commercial prosperity of the country. Given the establishment of the industries—agricultural, mineral, pastoral, &c.—above-mentioned, the points to be considered are: (1) the development of irrigation; (2) the present condition and utility of the Trans-Caspian railway; (3) the future railway and commercial policy of the Government; and (4) communications.

The three great rivers of Turkistan for irrigation purposes are the Sir-darya, the Zarafshan, and the Tchirtchik. The two latter are pretty well used up for irrigation, so much so that Bokhara nowadays does not receive nearly as much water from the Zarafshan as she requires. This is why a canal from the neighbourhood of Kilif or Chushka-guzar, on the Oxus, via Karshi to Bokhara, is projected. It will bring under cultivation thousands of additional square miles. The Sir-darya should certainly be utilised to furnish a canal across the Galodnaya steppe to Jizak. This steppe is at present a ghastly dusty roadless and waterless desert, connecting the capital of Turkistan (Tashkent) with the terminus of the Trans-Caspian railway (Samarcand). A canal across this from Tchinz to Jizak would be a godsend to the traveller. Turning to the Oxus it would seem that it can be and ought to be utilised for the irrigation of the Chul on its left bank. As to its capabilities in this respect, I had better suggest a reference to a lecture delivered recently by M. Lessar before the Geographical Society at Paris. Some talk of flanking the railway from Charjui to Bairam Ali with a canal; others pooh-pooh it, as a useless expense.

Doubtless every use is being made of the Murghab at Merv and of the Tejend for irrigation. However, the irrigation work to which all attention is now being devoted is that of Band-i-Sultan, on the Murghab, about 40 miles south of Bairam Ali. As is well known, M. Kosel Poplefsky has been unsuccessful, and Sir Colin Moncrieff has gone to Band-i-Sultan to advise and assist. The loan of the services of an officer of the Royal Engineers for such a purpose is a generous act on the part of our Government. That the *Novoe Vremya* and other Russian journals should cavil at it, and clamour for a French engineer, is but a natural expression of national sympathies. If Russia is desirous of repaying the compliment that the British Government has paid her, she might lend us the services of an officer of Russian engineers to superintend the removal or circumvention of the rocky barrier on the Karun river near Ahwaz. Bairam Ali is the site of an extensive Imperial domain, founded on the ruins of successive cities, dating from pre-Alexandrian times down to about 1780. Handsome houses are being built there, and already an extensive

nursery and garden, covering many acres, has been established. Acacias planted two years ago are from 15 to 20 feet high already. They grow almost visibly. It is estimated that, when the Sultan-Band dam is completed and the irrigation canals are in working order, at least 100,000 acres at Bairam Ali will be brought under cultivation.* The Russian engineer officer in charge was good enough to explain to me the system of irrigation that was to be carried out. Further, in connection with this will be the canal, which, starting from the Maruchak Band, will irrigate Sari-Yazi and the several oases between Panj-deh and Yulatan. When these canals are all ready, the Russians will no doubt be in a position to make the most of the Murghab for purposes of cultivation; and then in course of time the connection between Bairam Ali (and Merv) and Herat will be satisfactorily established. I believe that General Annenkoff looks forward to the time when irrigation will turn Trans-Caspia from a barren desert into a comparatively well-cultivated province. However, after all, the most sanguine anticipations can only irrigate a small portion of it. Even when Russia controls the whole water-supply of the Persian Highlands from Sarakhs on the east to Chat on the west, the supply will be little more than a drop in the bucket.

The Trans Caspian Railway (900 miles long from Uzun-ada to Samarkand) is good enough for ordinary slow traffic—15 miles an hour is the pace of the mail. The gauge is 5', that of the ordinary line in Great Britain being 4' 8½". It may be blocked by sand and breached by flood, but the Russians say they have no reasons for anticipating serious trouble from these causes. The saxaul barriers put up flanking the line look as if they would not stop a puff of dust, far less a column of drifting sand. Saxaul is also used for binding the edges of the permanent way where it is of sand, and this purpose it seems to answer well. I saw nothing to lead me to suppose that the traffic on it is extensive. The mail trains between Samarkand and the Caspian run three times a week each way and there is a daily mixed train each way. Trains for water, food, astatki, &c., run as required. I heard of and saw no other trains running. It would hardly appear as if this very small amount of traffic would make the line pay. However, the figures of General Annenkoff's "officially revised balance sheet" (quoted in the *Times* of 10th October last), show that the line pays its expenses. The wooden bridge over the Amu-darya (Oxus) answers the requirements of the moment. It is doubtful if it would stand increased or accelerated traffic (four to six miles an hour is the rate at which trains now cross the bridge). Before an expensive permanent bridge can be constructed, the present capricious tendency of the Oxus to change its

* Since this was written early in November, 1890, anything but favourable reports as to the irrigation prospects at Bairam Ali (reports said to be based on the opinions of Sir Colin Moncrieff and M. Cotard) have been freely circulated.

channel must be checked. The line is managed by two railway battalions, a very good lot of officers and men and well turned out. It is not reasonable, however, as one or two writers have done, to go into raptures over the wonderful feat of making the line, and its excellent management by railway battalions. No line ever had less engineering difficulties to contend with, and, if their railway battalions were told off to manage any one of the principal lines running in and out of London, there would be a terrible accident and a block in less than 24 hours. I presume more trains pass through Clapham Junction in an hour than pass through Ashkabad and Bokhara in a week. Mr. Curzon, not without good reason, commences his book on Central Asia with a protest against Russophobes and Russophiles. I, too, protest against those who exaggerate, and those who unduly detract from the condition and value of General Annenkoff's railway.

Of the extension of the Trans-Caspian railway nothing certain can be said by me. All attention seems to be turned now on the Siberian railway. M. Vyshnegradski visited Central Asia in September and October last, and his opinion as to the best field of railway extension will, of course, carry weight with the Czar. For both political and commercial reasons, construction of additional railways in Siberia and Central Asia is a much needed work. But the Russian Government may well look askance at the cost. As before remarked, dependencies must be made to pay. If from 50 to 100 million pounds are sunk in railways in Siberia and Central Asia, will it ever bear any adequate interest? Leaving political and strategical considerations apart, will the cereals and minerals of Siberia, and the tea and other trade with China, provide a surplus of receipts over expenditure on a line from the Ural to Vladivostock? Will trade with Afghanistan pay for extensions to Pul-i-Khatun, Chikil-dukhtar, Kerki, or Kilif? Some say that an extension from Samarkand is more likely to run to Kokand direct than to Tashkent. Under any circumstances, it is certain that when the Siberian line is completed, the Trans-Caspian line must be joined to it, whether the point of junction be Tomsk, Tiumen, Semipalatinsk, or elsewhere. It is of course obvious that an extension of the Russian railway system to the Afghan frontier would not be solely for commercial reasons. The commercial treaty between India and the Amir, whom we regard as our protégé, is not nearly so favourable to Indian trade as it ought to be.

To conclude, there is nothing more noticeable, either in European Russia, or in Central Asia, than the absence of decent roads. Russia will spend money on many things, but not on roads. It is true that there is a good carriage road from Ashkabad to Mashhad, but then the Persians made most of that. It is curious to see Russia now proposing to spend from 50 to 100 million pounds on a Siberian railway, while there is hardly a well-paved street in St. Petersburg, Moscow, or Warsaw,

and outside the towns few made roads. All one can say for Central Asia is that the ordinary roads of the country are as good as the local mode of transport requires. No doubt in time there will be a Grand Trunk Road from Krasnavodsk to Kokand, and thence to Kuldja or Kashgar.

Lands of the Globe still available for European Settlement.

By E. G. RAVENSTEIN.*

Maps, p. 64.

THE question which I have been invited to discuss before you to-day bristles with difficulties, owing to the paucity of the facts which are at our disposal. In order to answer it at all satisfactorily, I shall be compelled to determine:— (1) The present population of the world, and its probable increase. (2) The area capable of being cultivated for the yield of food and other necessities of life; (3) The total number of people whom these lands would be able to maintain.

Speaking in the presence of so many able economists and geographers, I need not point out, that a precise answer to these apparently simple questions is quite beyond my power. Even if the present inquiry were to be restricted to the British Islands, it would be impossible to give a reply, likely to be accepted by all parties, for opinions differ so widely on points which necessarily must be taken into consideration.

The Present Population of the World.—I shall first of all address myself to the task of estimating the present population of the World. This is a fundamental question in connection with the inquiry we are engaged in, but it is quite impossible to reply to it with any amount of confidence. Enumerations of the people have been made in all civilized states, but with respect to large parts of the world we are still completely in the dark. Of Africa we know next to nothing, whilst the long arrays of figures presented to us as the result of a census taken in China are not calculated to inspire confidence. I have taken some care to form a true estimate of the population of Africa, and I cannot believe that that continent supports more than 127 millions, instead of the two, three, or even four hundred millions allotted to it by certain statisticians. Even 127 millions is a high figure, for it means eleven people to the square mile, while in Australia there are not one and a half, and in South America only five. On the accompanying diagram I have distinguished those parts of the world which are most densely peopled.

THE WORLD'S POPULATION IN 1890.

	Total.	To a Square Mile.
Europe	380,200,000	101
Asia	850,000,000	57
Africa	127,000,000	11
Australasia	4,730,000	1·4
North America	89,250,000	14
South America	36,420,000	5
Total	1,467,600,000*	31

* Exclusive of 300,000 in the Polar regions.

* Read at a joint meeting of the Geographical and Economic Sections of the British Association, Leeds, September 8th (vide 'Proceedings,' November 1890, p. 671).

The Cultivable Area.—In my endeavour to obtain some idea of the cultivable area of this world I at once shut out from consideration all those territories of the Polar regions which lie beyond the limits within which the cultivation of cereals is possible. Of course, these regions yield game and fish, and berries, and even vegetables in a few favoured localities, but the few hundreds of thousands of people whom they support at the present time, are of no account at all when dealing with hundreds of millions.

The first region of which I take account I describe as "fertile," but it is fertile only in as far as within it lies most of the land which is capable of remunerative cultivation. It cannot be assumed for an instant, that the whole or even the greater part of it could ever be converted into fields yielding the fruits of the earth. There are within it mountains, which will never tempt the agriculturist, sandy tracts, capable of supporting only forests, and even steppes or poor savannahs, not fit for anything except the raising of cattle. In Europe (exclusive of Russia and Turkey), where cultivation has nearly reached its utmost limits, not quite 40 per cent. of the total area are under the plough, 18 per cent. are described as meadows, and pasture lands, and 23 per cent. are covered with woods. The remainder (20 per cent.) is covered with water, built upon, or consists of barren wastes. Some of these wastes could no doubt be rendered productive, and efforts in that direction are being made in various parts of Europe, but a reduction of the area now covered by forest, seems by no means to be advisable.

My second region includes the "steppes" or poorer grass lands, and as within the "fertile" region we met with comparatively sterile tracts, so within these "steppes" there exist large areas which can be rendered highly productive, especially where means for irrigating the land are available.

The third region includes the deserts, within which fertile oases are few and far between.

The area of these regions in square miles I estimate as follows :—

	Fertile Region.	Steppe.	Desert.	Total.*
Europe	2,888,000	667,000	..	3,555,000
Asia	9,280,000	4,230,000	1,200,000	14,710,000
Africa	5,760,000	3,528,000	2,226,000	11,514,000
Australasia	1,167,000	1,507,000	614,000	3,288,000
North America ..	4,946,000	1,405,000	95,000	6,446,000
South America ..	4,228,000	2,564,000	45,000	6,837,000
Total	28,269,200	13,901,000	4,180,000	46,350,000

* Exclusive of the Polar regions (4,888,800 square miles), which have at present a population of about 300,000 souls.

The possible Population.—I now approach the difficult task of estimating the number of people whom this earth of ours would be capable of supplying with food and the other necessities of life, once it had been fairly brought under cultivation. An estimate of this kind is subject to several preliminary conditions. I observe, for instance, that there are present some vegetarians. These, if their opinions were asked, would maintain that if man returned to nature, and fell in with their peculiar views, three men could live where one lives now, and six men might take the place of one of our larger domestic animals, which would, of course, become extinct, once their dietary value became a thing of the past. Views like these have met with considerable support from certain "hygienists," one of the most prominent of whom has even held out a hope that the day would come when food, as toothsome as meat

and equally nutritious, might be grown in our fields, thus obviating the necessity of keeping up large herds of cattle and sheep. I am not sufficiently utopian to believe that mankind generally will ever be prepared to accept these principles, or, that, having accepted them, man would not degenerate.

Again, it has been asserted that our present methods of cultivation are capable of vast improvement; that the earth might be made to yield much larger harvests than it yields now; and that population might thus be permitted to increase without correspondingly increasing the cultivated areas. This no doubt is true as respects many countries, but it is hardly true of the world at large. In the United States, for instance, and generally speaking in all newly-settled countries, where large tracts of unoccupied land are still available, agriculture is carried on in a wasteful style, the cultivator looking only to immediate returns and having no thought of the prosperity of his descendants. If you travel from Montreal to Washington you pass through millions of acres of land, which were once most productive and are still lovely to look upon, but which nevertheless produce nothing. The forests have been devastated in the most reckless style, and swamps and sandy wastes have taken the place of trees. These things, however, will be mended in course of time; the exhausted soil of the eastern states will recover; and the forests, where wantonly destroyed, will be replanted. In proportion as the population increases, so will the resources of the country be more carefully husbanded.

Of course, when preparing my estimate of the possible population of the globe, I assumed that the available areas would be rationally cultivated, and I even admitted a slight improvement in the yield of each acre. That such improvement is possible, even in our highly cultivated Europe, is amply proved by increased productiveness of the land, as shown by recent agricultural returns. Such improvements, however, should go towards raising the standard of life; for it cannot be denied that there are millions whose food-supplies, though sufficient to maintain life, fall yet far short of what is necessary to insure health and a full development of the physical faculties.

Making these observations, I am in a position to take for a basis of my estimate the standard of life, such as we find it to exist in various climates and among various peoples. I take for that purpose certain representative countries of ancient culture, which maintain their present population without being obliged to draw upon the resources of other countries lying beyond their borders. Taking, for instance, the whole of continental Europe, stretching from the North Sea and Atlantic to the Black Sea, I find that it supports a population of 156 inhabitants to the square mile. Some of the countries included, such as Germany and France, are no doubt large importers of food stuffs; but others, and notably Hungary, Roumania, and Bulgaria, yield a considerable surplus, which in the near future may be required for their increasing populations, but which for the present is available for the existing number of inhabitants. A deficiency there may be, but I feel sure it could be made up by the less developed countries in the south-east.

Passing from Europe to Asia, we find India supporting a population of 175 to the square mile, and yet exporting increasing supplies of wheat. In China there are 295 to the square mile, in Japan 264. Of course, the standard of life in these countries is different from what it is with us, and it is not likely to undergo any material change in the near future, for diet is as much a question of climate as it is of inherent disposition. Taking, then, the countries named as a whole, and looking upon them as being fairly representative of what I have called the "fertile" regions, I find that their mean population is 207 to the square mile. If I accept this figure as approximating the truth, the "fertile regions" would be able to support 5851 millions human beings, and this I believe to be a moderate estimate.

The "steppes," with their large tracts of land capable of cultivation, I believe to be capable of supporting ten inhabitants to the square mile, whilst the "deserts" would be fully peopled if they had even one inhabitant to a square mile.

The total possible population would consequently amount to 5,994,000,000.

You will have observed that in what I have said hitherto I have not alluded to the colonisation of tropical regions by Europeans. Of late we have heard a great deal about this important question. Quite recently a Dutch physician, who attended the medical congress at Berlin, asserted, without any reservation, that the acclimatisation of Europeans in tropical countries presented no difficulty whatever, whilst in books of travel it is frequently stated that one or the other region was perfectly fit for European settlement. I cannot accept these sanguine views. I am quite willing to concede that Europeans can live there for three, ten, or fifty years without returning to the bracing influence of their native climate to recruit their health, as also that sanitary measures have largely tended to lower the death-rates among European residents. That mortality is, however, still very high. In proof of the comparative healthiness of the climate in the Congo State, it has been asserted that the death-rate among European officials only amounted to 60 in the thousand. That, however, is a tremendous mortality, especially if it is borne in mind that it occurred among picked men, not one of whom had been sent to Africa without a medical certificate, and many of whom returned, invalided, long before the expiration of their three years' service.

A temporary residence in a tropical country, however, with occasional visits to a more temperate region, is not usually understood to be "acclimatisation." The possibility of European acclimatisation in tropical regions can be asserted only after it shall have been proved that it has succeeded in a single instance. I look in vain for such proofs. Have the English become acclimatised in India, or the Dutch in Java? I even venture to assert that the Portuguese have failed to create for themselves a permanent home in Brazil. Portuguese are continually arriving in that country, but many return home after they have realised a competency, and the population increases very slowly. Stop the supplies, and this growth among the whites may cease altogether, and the future explorer may meet there no more traces of Portuguese blood than does the traveller in Spain or Northern Africa who looks for the descendants of Goths or Vandals.

To render tropical countries fit places of residence for European colonists it will be necessary either to change the constitution of Europeans or to bring about a change in the climate. The latter is quite beyond our power; the former could only be effected by gradual acclimatisation. In order to bring home to you some of the characteristics of these tropical climates, I have prepared a couple of diagrams. The first of these exhibits the mean annual range of temperature, or rather the difference between the mean temperatures of the coldest and warmest months in the year. You will at once perceive that this range is very small, amounting in many parts to less than 5° Fahr. It would be smaller still if it were not for the great diurnal range, that is, the great difference which exists between the temperatures of night and day, a difference which may prove refreshing for a time but which ultimately exercises a most baneful influence upon European constitutions. In my second diagram I have attempted to show the distribution of relative humidity over the globe. My diagram is based upon very imperfect data, but it sufficiently illustrates the fact that the relative humidity of many tropical regions does not exceed that experienced within the British islands. It must be borne in mind, however, that whilst with us relative humidity is attended by a cool temperature, within the tropics it is rendered dangerous on account of the prevailing heat. I hardly need point out to you the hygienic effects of a combination of great heat which promotes

perspiration, and a high degree of humidity which checks evaporation. They are sufficiently patent to all who have considered the subject.

Another assertion, frequently heard, I cannot pass over in silence, namely this, that by ascending a plateau within the tropics the European can secure any climate he may find suitable. Nothing could be more fallacious.

A mean annual temperature corresponding to that experienced in Europe could no doubt be insured by ascending to a certain altitude within the tropics, but habitable plateaus or mountain-slopes affording this mean temperature occupy but a comparatively small area, whilst, at the same time, the mean annual temperature is not the true criterion of a temperate climate. At Kakoma, for instance, on the Unyamwezi plateau, at an elevation of 3600 feet over the sea, the mean temperature is 72°, the annual range amounts to 16°, and the diurnal to 29°, whilst the relative humidity does not exceed 62 p.c. Compare this with London, where the relative humidity rises to 80 p.c., but where the mean temperature does not exceed 50°, whilst the annual and diurnal ranges amount to 26° and 11° respectively. There could exist no greater contrasts between two climates. There may be found a few localities within the tropics which prove an exception to the rule, such, for instance, as the Matabele plateau, which stretches like a broad pier from temperate into tropical Africa; but, broadly speaking, the tropical regions are not adapted for colonisation by Europeans. For the present, at all events, the white man must be content to settle there temporarily, to teach the natives the dignity of labour, and to lead him on to a higher plane of civilisation.

If the white man is ever to occupy permanently the tropical parts of the world, it will have to be done by stages, each stage marking a generation of men. We well know that the peoples of southern Europe, such as the Italians and southern Frenchmen, can better bear the climate of sub-tropical Africa than can northern Europeans. A steady stream of migration is in fact setting in that direction. Germans and Belgians are pouring into France; Frenchmen are going to Algeria; the Arabs from the shores of the Mediterranean have found their way into the Sudan; whilst the Sudanese are pushing forward into Bantu Africa. A similar movement is going on in southern Africa. The descendants of those Dutchmen, who a couple of a hundred years ago first settled at the Cape, have made their way to the Transvaal, and European migration, favoured by geographical features, is being pushed even within the tropic towards the Zambezi.

Time alone will show whether these migratory streams will attain a force sufficient to make a permanent impression upon the tropical world. For the present, at all events, I am constrained to maintain that the tropical regions are no fields for European emigrants. If, notwithstanding this, I make no deductions from the number of people whom I suppose the world to be capable of supplying with food and other necessities, I do so because it is not necessary that the consumer of food should live in the country which produces it. Even now there are countries which depend for their supplies of necessities upon distant regions; and, in proportion as the interchange of commodities is facilitated, and the great resources still lying undeveloped are brought to the front, so will the food supplies of the world keep increasing. A time will surely come when the millions densely crowded together in the temperate regions of the world will draw a large proportion of their food supplies from tropical countries, which at the present time just manage to maintain their own scanty populations, and sometimes not even that.

I therefore assume that this world of ours, if brought fully into cultivation, can supply 5994 million human beings with food and other necessary products of the vegetable kingdom.

The Increase of Population.—The next question to which I have to address

myself is the increase of the population. On this point not only are our statistics still very incomplete, but conditions, social or otherwise, may arise which would materially affect the present movements of the population. In France the population increases but slightly, and that to a large extent owing to foreign immigration. Even some of the American States are decreasing in population, whilst elsewhere it is found that the superior race increases at a slower rate than do the inferior races inhabiting the same country. Are we to look upon these checks to an increase of the population as a natural law, the operation of which would, without violence, war or pestilence, prevent the over-population of this world? Are we permitted to suppose that a time will come when mankind shall be so civilised and provident as to submit to checks to over-population, which at the present time are submitted to only by a few? I must leave the discussion of these questions to philosophers, and shall content myself with an endeavour to determine the increase which takes place in a decade at the present time, or is likely to take place in the immediate future. The scanty data upon which an estimate of this kind can be based I need not dwell upon in the presence of so many eminent statisticians. As to Europe, we have trustworthy data for the greater part of it. Asia I can estimate only on the basis of the Indian and Japanese census returns, and upon a few other enumerations. For a great part of America too, and for all Australasia, we had data sufficient for our purpose. As to Africa, however, we know next to nothing. For the present, at all events, the population in that continent does not appear to increase at all, except in the European colonies and settlements. I must assume, however, that the united efforts of Europe will ultimately succeed in establishing security for life and property, and stopping intertribal wars. The compulsory emigration of Africans has already become a thing of the past. All this must tend to give an impetus to the growth of the population, and I therefore assume that the increase, in the course of a decade, will amount to 10 p.c.*

Summarised, the results of my careful estimates are as follows:—

	Increase in a Decade.
Europe	8·7 p. c.
Asia	6 "
Africa	10 "
Australasia	30 "
North America	20 "
South America	15 "
<hr/>	
The whole earth	8 "

Conclusion.—Accepting these figures as correct, it becomes an easy matter to compute the increase of the population. By the close of this century, the 1468 millions who now dwell upon the earth will have increased to 1587 millions; in the year 1950 there will be 2332 millions; in the year 2000, 3426 millions; and in the year 2072, or 182 years hence, there will be 5977 millions. These estimates are not presented as a prophecy. I have already hinted at voluntary checks to the growth of population, which will come into play in proportion as civilisation advances, and the demands for the comforts of this life shall become more general. At all events, as far as we personally are concerned, one hundred and eighty-two years is a long period to look forward to; but if we look back a similar number of years and remember that William III. and Marlborough were then still among us, we are bound to admit that it is but a short period in the lifetime of a nation.

* In the British West Indies the population between 1871 and 1881 increased 14 per cent.

The following discussion ensued on the reading of the above.

Prof. ALFRED MARSHALL (President of the Economic Science and Statistical Section) expressed on behalf of that section the great obligations which they were under to the Geographical Section for having arranged the discussion, and to Mr. Ravenstein for his admirable paper, on a subject of so great interest and of such vital importance to economists. He would leave the discussion of the main question for others; but before sitting down would venture to remark that Mr. Ravenstein had not explicitly called attention to the question of fuel. There were many who thought that a check to population in the future in temperate regions would come from the scarcity not of food but of fuel; while there were others who said, "Oh, no; a copper wire, a few yards thick, from the Sahara to England, would supply us with all the heat and all the force we shall ever want." In that case, they would see, they went beyond the geographers and required the assistance of the physicists. There was scarcely any aspect of the question which had yet been exhaustively studied, and of which they knew anything that they were quite sure they would not have in some measure to unlearn. And when they had found out their facts they would still be troubled with this—Supposing they were careful not to over-populate, how were they to be sure that the world would not be over-populated by people who were less careful, and whom for that very reason, perhaps, the world would less care to have?

Sir RAWSON W. RAWSON said Mr. Ravenstein had submitted to them large and general views which he thought would be profitable to those who would analyse them. No one was more capable than he to give them an estimate of the population of the globe. He had told them that the question now before them was colonisation, and he had also said that a considerable portion of the unoccupied land area was tropical, and was not suited to Europeans. He (Sir R. Rawson) believed that the proportion of land in the different zones was as follows:—About 50 per cent. of the whole land was in the temperate zone, about 40 per cent. was in the torrid zone, and about a tenth in the Arctic zone. Before going further in dealing with a future home for the surplus population of Europe they must ascertain the areas that were suited to a European population. It was quite certain that the surplus population of our own country and that of the north of Europe could only occupy a temperate zone. It was also essential that they should know how much was available in each of the zones. The Italians, Spaniards, and French, had settled in very large numbers in South America, and that was open to others born in a warm climate. But what was to become of the surplus population of China and India? He thought it would be necessary to have some inquiry into the matter as to how much of each portion of the world was available for settlement. Regarding France, he could confirm the statement that the native population had made no progress at all, and that the population sprung from their own race was actually decreasing. It had been suggested that they should request the council of the British Association to appoint a committee for the purpose of investigating the matter, and another suggestion had been that it was a subject well worthy of consideration by the International Statistical Institute, of which he happened to be president; but whilst it was a subject which they might well take up, he thought it was one that they (the British Association) would be much more competent to take up themselves. England was more interested in the subject than any other nation, and possessed means of procuring information beyond those of any other country. He hoped the result of the paper would be of practical value. He believed Mr. Ravenstein's investigation might lead to very useful results for this country and others.

The Rev. Dr. CUNNINGHAM pointed out that the intensity of production
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might be much increased through the direction of native labour by European intelligence. The ultimate possible total of the world's population was a fact which ought to be well borne in mind, but in calculating this it should be remembered that not only must food-raising areas be allowed for, but also areas for the production of necessary raw materials and fuel. The nearer the ultimate limit was approached the greater attention would be paid to all forms of economy, and the more slowly would the growth of the population proceed.

Mr. WELLS, who spent many years in Brazil, said there was an area in the south of Brazil which might be called the Transvaal of South America. To the north-west of Rio lay a considerable coffee-producing area, with an exceedingly healthy climate, and the productive powers of the country were far indeed from being appreciated. Owing to the influx of British capital into Argentina for the construction of railways, a great stream of emigration had set to that country of late years; but now that railways were being constructed in all directions in Brazil, the stream of emigration was rapidly turning thither, where in the south of that country a climate and soil far superior to those of Argentina were to be found. It was a curious fact that in South and Central America, as well as in the States, the people all acquired a nasal pronunciation of the language of the parent countries.

Mr. JOHN COLES, F.R.A.S., Secretary of the Geographical Section, said that too much might be made of elevated plateaus. British Columbia was said to have one of the best climates in the world, and yet a mountain fever very much resembling yellow fever was found there. Irrigation works, too, whatever their benefits, undoubtedly produced malarial fever. The area of land available for colonisation in the far west of the United States was, generally speaking, very much over-estimated. Most of it was taken up in large tracts by speculators who demanded higher prices than the ordinary emigrant could pay.

The Rev. JOHN MACKENZIE said that experience had shown that South Africa was habitable for both the north and south European. He himself had lived beyond the tropical line for many years, and had seen Englishmen thrive and rear families there. The reason of this was that north from Cape Colony, in the interior, a great altitude was attained, but even in the low-lying districts of Mashonaland, where the land was cultivated and well drained, Englishmen could live well.

Mr. STEPHEN BOURNE (of the Statistical Society) thought that Mr. Ravenstein's conclusions would dispel the absurd fears often promulgated as to the growth of the world's population. It would be unnecessary to discuss now means for checking reproduction of the species. The great duty of the present time was to economise the resources of production. The present habits of acquiring and distributing wealth left room for very great improvement. The resources of the country, for instance, would be greatly enhanced by a reduction in the excessive consumption of alcoholic liquor; and England had yet to learn how to utilise her sewage as a fertiliser to the best advantage. Great results, too, might be expected from improved methods of cultivation and extended modes of transit. Tropical regions would be found far less unsuitable to the Saxon if the habits of life prevalent in a temperate climate were not absurdly insisted upon in the tropics.

Dr. J. G. GARSON, Secretary of the Anthropological Section, said that many people going to tropical climates endeavoured to live in the same way as in Europe. The same amount of animal food was not needed in the tropics as in the temperate zones, and alcohol was less necessary, though it could not be altogether dispensed with as a medicine. The question of drainage was most important, though it often occurred that the first steps towards sanitation were followed by outbreaks of fever, owing to the saturation of the soil with sewage. Elevation above the sea-level

also exerted a great influence on health. The great thing for emigrants was to choose a climate as nearly as possible like that to which they were used.

THE PRESIDENT OF THE GEOGRAPHICAL SECTION (Sir Lambert Playfair) read the following letter from Mr. E. A. Maund, on European settlement in tropical South Africa:—"I know there are many who hold the theory that no tropical countries are colonisable by Europeans, especially by the Saxon as opposed to the Latin races. These theorists hold that this is more particularly applicable to Africa. The idea of lands available for colonisation I take to mean lands to which a poor man crowded out from England, or broadly from Europe, can emigrate in the full sense of the word—i. e., to settle with his family, or to go out and bring up his family unharmed by the climate; not, as on the West Coast, to be obliged to return periodically to recruit his shattered health, not to be obliged to send his children home to be reared—in short, not to be dependent on Africa for his living and on England to live. This theory of incompatibility of climate is seemingly sound, and as yet we have had little practice to definitely combat it. But as one who has visited the Highlands of tropical Africa, I maintain that the theory can be rebutted by stubborn facts. In Matabele-land Englishmen have lived for twenty years without needing homeward journeys for health. Missionaries have reared families, and their children have married other missionaries and settled in the country. True, that these children returned to England—not to be reared, be it understood, as used to be the case with Indian children at a very tender age; but to be educated. Traders and Dutchmen have reared families there, who have again married and reared children of the second generation, robust in health, but lacking, alas, education. This proves that white men can live there, and colonise on sound principles. Then comes the question whether the country can support, by good supply, a white population. This, with regard to Matabele-land, I think I sufficiently proved in the paper I read to the Geographical Section; and Mr. J. Mackenzie will, I am sure, bear witness that the country is capable of great farming development. Wheat, maize, kaffir-corn, and rice will doubtless be far more universally grown than it is now when, as I expect we shall shortly see, there is a mining population to be supported. Having been in Matabele-land in all seasons, rainy and dry, I believe it to be thoroughly colonisable. This country, though within the tropics, has perhaps peculiar advantages not enjoyed by many tropical regions; a large portion of it lies at an elevation of from 3000 to 5000 feet above sea-level, and it has a good rainfall. The atmosphere during two-thirds of the year is exceptionally dry and salubrious, while the seasons are well marked.

GEOGRAPHICAL NOTES.

Exploration of the Ancient Ruins of Zimbabwe and the Lundi in Mashonaland.—We are glad to announce that a competent observer, Mr. J. Theodore Bent, the explorer of Phœnician remains in the Bahrein Islands, has decided on undertaking an expedition to the mysterious ruins of Zimbabwe or Zimbaœ, and other remains in the interior of South Africa, with the object of thoroughly examining the structures and the country in their neighbourhood. The expedition has the active co-operation of

the British East Africa Company and the Royal Geographical Society, and will be well equipped for geographical as well as archæological survey. It leaves England at the end of the present month.

Colonel Pievtzof's Expedition.—According to a despatch received at St. Petersburg on 30th October, the expedition of Colonel Pievtzof has commenced its return journey from Tibet.

Return of Captain Grombchevsky.—The expedition of Captain Grombchevsky to Tibet returned in safety to Osh (Ferghana) at the end of October last. According to the last news recorded in our pages,* the intrepid traveller was about to leave Polu for the plateau of Western Tibet, hoping to reach Lhassa. From Polu he crossed the Kuen Lun Mountains by an extremely difficult pass, that of Lubashi, which lies at an altitude of 17,500 feet; and then, having penetrated as far as the little lake of Gugurtlik, and ascertained by a reconnaissance eastwards that the plateau, which is also about 17,500 feet high, was then (May) covered with ice and snow, he retraced his steps to Kashgar. This region is only practicable from July to September. From Kashgar to Osh he took a new route via the pass of Kizil-Art (14,020 feet), which is situated at the sources of the Markan-Su, and thence crossing the Taldyk Range, and finally reaching Osh by way of Gulcha and Langar. His companion was a German entomologist, M. L. Conradt, of Königsberg. The total length of the itinerary during the seventeen months was about 4600 miles. During five consecutive months the party remained at altitudes above 14,000 feet, and at times they reached 19,000 feet. The results of the expedition are stated to include 73 astronomical observations, 367 observations for altitude made with the boiling-point thermometer, and over 3000 meteorological observations. The collections contain 2000 birds, 2000 botanical specimens, 35,000 insects, and 50 or 60 remarkable specimens of mammals.

M. Rabot's Journey to the Basin of the Petchora.—M. Charles Rabot the well-known French explorer of northern latitudes, completed last summer a survey with the compass of the upper basins of the Petchora, the Schugor, the Syga, and the Sosva. His travels also extended into the northern Ural, where by barometrical observations he determined the altitudes of a number of points. His natural history and ethnographical collection, especially the latter, are very complete, and form a valuable addition to those already made by him in northern Scandinavia and the circumpolar regions.

Fixed Points on the Congo.—Captain Delporte, who has been surveying on the Lower Congo, in the neighbourhood of Matadi and Nokki, has been able to make the following precise observations:—Matadi lies in S. lat. $5^{\circ} 49' 27''$, E. long. $13^{\circ} 30' 40''$; Ango-Ango, $5^{\circ} 51' 00''$ S., $13^{\circ} 29' 19''$ E.; Nokki, $5^{\circ} 52' 16''$ S., $13^{\circ} 29' 01''$ E.

* 'Proceedings R.G.S.', 1890, p. 467.

Exploration between the Lomami and the Lualaba.—M. Hodister, agent of the Upper Congo Company at Bangala, has sent to the *Mouvement Géographique* an account of a recent journey which he made up the Lomami, and across country from that river to Nyangwè. On board the small steamer, *General Sanford*, M. Hodister ascended the Lomami, the affluents of which he surveyed, as far as the station of Bena-Kamba, at the foot of the rapids which, two years ago, stopped M. Delcommune. M. Hodister makes an important correction in the position of Bena-Kamba, which, instead of 4° S. lat., he finds to be only $2^{\circ} 50'$ S., or about the same latitude as the Arab station of Reba-Reba, on the Lualaba. From Bena-Kamba, M. Hodister, accompanied by twenty Bangala natives, marched south and south-east till he reached the Lualaba, opposite Nyangwè. From Nyangwè he ascended the river in a canoe to Kasongè, then down to Reba-Reba, whence he proceeded westward to the Lomami, reaching Bena-Kamba after an absence of thirty-nine days. M. Hodister took careful observations along his journey, and so has been able to some extent to fill up the blank between the Lomami and the Lualaba. About thirteen hours' steam journey above its junction with the Congo, the Lomami receives the Tombassi on its right bank. It has a sinuous course obstructed by snags. Both from the east and west the Lomami receives many affluents. The lower Lomami is covered with islands and sand-banks, and is from 1000 to 1300 feet in width. In the upper part, its course is broken by rocks and rapids, and the breadth narrows to about 200 feet in places. The population on the banks of the river is extremely dense. It may be stated that M. Le Marinel in an expedition from the camp of Lusambo, on the Sankuru, has solved the problem of the two Lomamis. The one seen by Commander Cameron is that which flows directly into the Congo, and which M. Hodister has navigated; the small Lomami, which is an affluent of the Sankuru, flows to the lower course of the river Lubefu, traversed by Wissmann. M. Le Marinel reached the Lomami at 5° S. lat., and following it northward, found its course obstructed by rapids from $4^{\circ} 45'$ S. to the latitude of Bena-Kamba.

The Head-waters of the Mongala.—The enterprising explorer mentioned in the preceding paragraph also effected last spring a fresh exploration of the upper course of the Mongala, with the result of discovering that its head-waters are spread over a much larger extent of country than had been supposed. He followed the head-stream Dua up to a small lake Ababula, and another stream, the Ebala, for a considerable distance. Both these streams flow through dense forests.

Captain Van Gèle on the Welle-Mobangi.—Captain Van Gèle left Leopoldville in May 1889, to continue his explorations on the Mobangi. He arrived at the Zongo rapids on June 25th, the last news received

from him being dated December 23rd, 1889. We learn that the explorer ascended the Welle-Makua, and passing the extreme point reached by him in 1888,* arrived at the Seriba of Abdallah, near Ali-Kobo, visited by Dr. Junker in 1883. As it is known that Commandant Roget traversed by canoe the section of the river between the Seriba of Abdallah and the settlement of Jabbis, where the Free State has a station, the Mobangi-Welle-Makua is now known over a distance of more than 750 miles. Jabbis lies about 24° E. long., i.e. about one degree east of Abdallah's Seriba.

M. J. Cholet's Exploration of the River Sangha.—At the meeting of the Geographical Society of Paris held on 7th November, M. Cholet, the Administrator of Brazzaville, gave some account of his recent ascent of the Sangha, an important and hitherto practically unexplored tributary of the Congo. The Sangha enters the Congo at Bonga, a French station between the embouchures of the Alima and Mobangi. The traveller, who was accompanied by M. Pottier, quitted Brazzaville in the little steamer *Ballay* on the 19th February, and on 30th March commenced their voyage up the Sangha. The river varies in breadth from 1000 yards to a mile and a half. Its course is encumbered with islands and sandbanks, the latter, when the waters are low, swarming with hippopotami. In the lower course the river banks are low and marshy; the villages lie far from the stream, and are inhabited by the Afurus, a commercial people, who bring ivory from the Upper Sangha down to Bonga. The middle course is inhabited by the Busindes, whose villages are situated on the banks, which are more elevated here. The upper part of the river, up to the point reached by the party, is inhabited by the Bassangas, a rich and powerful tribe, whose villages are built on islands. At the village of Uoso the Sangha receives an important affluent, the N'goko, and itself takes the name of Masa. The latter arm is over 2000 yards broad, but the sandbanks prevented an ascent being made for any considerable distance. The N'goko has, on the other hand, a narrow bed, never exceeding in breadth 220 yards. High wooded mountains lie on both sides of the stream. Elephants abound in this region. The people live at a distance from the river. A few miles above Uoso the N'goko receives a tributary, the Mangango (100 yards broad), and changes its name to Monba. Beyond this point the country seems quite uninhabited. Navigation becoming difficult and provisions failing, the return voyage was commenced on the 15th May, and Bonga was reached on the 31st May. The natives were friendly after their first fears had been overcome. They have no relations with the people of the Mobangi, and are not cannibals. Judging by their weapons, language, dances, they seem to resemble the Pahuins and the Udumbos. The country is rich in ivory; indiarubber was also found.

* 'Proceedings R.G.S.,' 1889, p. 325.

Ascent of Mount Ambondrombo, Madagascar.—Two Frenchmen, Dr. Besson and Père Tulazac, have succeeded in making the first ascent to the summit of Ambondrombo, dreaded by the Betsileos as sacred, or *tabu*. They, however, found five Betsileos willing to accompany them to the top. The party started from Amboasary, the nearest village to the mountain, and reached the summit in seven hours. Axes and knives had frequently to be used to clear the way. The mountain is rugged and wooded, reaching a height of 6234 feet. The party had to cross many ravines during the ascent.

Captain Page's Expedition up the Pilcomayo.—Further news of this unfortunate expedition has arrived in a letter from Mr. J. Graham Kerr, one of the English members of the party, who writes from "Lat. $24^{\circ} 58'$, long. $58^{\circ} 40'$," on the 4th October last. He says that the expedition started with provisions for six months, and that they had then been nine months on the way, and were in a starving condition. Fortunately, however, they had been able to kill a good many deer. The relief party of twenty soldiers, sent up by the Government, arrived on October 4th. The river Pilcomayo, he says, at that season is a mere brook, a few feet wide and only a few inches deep. Even in the season of higher water, when they ascended it, navigation was very difficult owing to the shallowness and the numerous snags and tree-trunks that encumbered the passage. In April they resorted to the laborious method of constructing dams below the steamer and waiting till the water rose to a sufficient height to move ahead for a short distance. They reached the position from which Mr. Kerr wrote on June 14th. Captain Page, as before recorded, died on his way down to obtain succour with three men in the only remaining boat. The remainder of the party, left to their own resources, were in daily fear of an attack from the hostile Indians of the Chaco; but, though watched continually, they received only one visit from them, on September 18th, and that passed off in a friendly manner. At the time of writing, preparations were being made for retreat down the river in the boat which brought up the relief party; if the boat should prove useless they intended to burn it and march to the Paraguay, a journey of two months or thereabouts.

M. Storm's Expedition up the River Pilcomayo.—The *El Diario* (3rd July) of Buenos Ayres announces the return of M. Storm's expedition from the Pilcomayo, after an absence of over five months. Like other expeditions into this region, the party encountered great difficulties, but fortunately escaped without loss of life. The river was navigated in the steamer for a long distance, and numerous obstacles were surmounted, but at last the leaders with a few men had to take to their canoes. Notwithstanding the hostility of the Indians, the party pushed on to the Bolivian frontier, and explored a large part of this

little-known region. They have brought back important zoological and botanical collections. There seems to be no doubt that the western arm of the river is the true Pilcomayo.

M. Coudreau's Explorations in Guiana.—M. H. Coudreau has completed the first part of the mission of exploration in the basin of the river Oyapock, with which he was entrusted by the French Government. The traveller when among the mountains of Emerillons, between the Inipi and the Appronague, was abandoned by his guides. This misfortune, which occurred in January last, caused the loss of much valuable time, so that the work of exploration had to be undertaken during the rainy season. The results of this winter campaign are as follows. The seven chief affluents of the Oyapock, which drain the whole of the south-east of the country, were surveyed on the scale 1:100,000; five out of the seven were ascended by the traveller up to their sources. His surveys include about 430 miles of quite unexplored country, besides 235 miles of new work on the Oyapock. Two of these tributaries carried him right into the heart of the Tumuc Humac Range, where he was able to study the native languages. He has collected two thousand five hundred words of the Oyampi language. The whole of the south-east region abounds in marshes, and presents a desolate picture. On all sides are the ruins of Indian villages. Small-pox and dysentery, and a steady emigration to the south-west of the country, are rapidly thinning the population, so that a generation hence, M. Coudreau says, the south-east will be practically uninhabited. The creoles may, however, be attracted to this region on account of its auriferous character, but it will not be easily exploited owing to the numerous falls in the rivers. In July last the traveller was about to start upon the second portion of his work. He intended to navigate the Oyapock to its source, cross the Tumuc Humac Mountains to the southern side, and visit the Indians living near the sources of the Tapanahony by a new route. Thence he will reach the Itany, descend the Aoua, and return across the whole central part of French Guiana. This central journey will occupy eight months.

Obituary.

T. P. Bigg-Wither.—Mr. Thomas Plantagenet Bigg-Wither, the well-known author of 'Pioneering in South Brazil,' was the tenth son of Lovelace Bigg-Wither of Manydown and Tangier Parks in Hampshire, where the family had resided for more than 500 years. Thomas was born at Tangier Park, on October 16th, 1845. He was educated at Bradfield College, Berkshire, and at King's College, London, where in 1865 he entered the Applied Science Department. He showed considerable natural ability and by steady application gained several prizes in this department. His success decided his future career as a Civil Engineer, a career marked by the same determination of character and enthusiasm in overcoming obstacles with which it was begun.

He now entered as a pupil upon the Admiralty Dockyard Extension Works at Portsmouth, the most extensive engineering works of the kind at that time, and here he laboured hard to acquire a thorough practical knowledge of his profession.

It was during this time that he gained a Whitworth Exhibition and afterwards competed for a Whitworth Scholarship, which he missed only by a few points.

He was still anxious to obtain a further insight into the work, but under conditions of responsibility which the position of a pupil did not carry; this he could only do by becoming a paid member of the outdoor staff as (under the somewhat antiquated rules of the service as regards designation) a foreman of works, and in this capacity he had charge of a section of the work for some time, carrying out his duties in a manner which gave the greatest satisfaction in every way.

In 1872 he was attached as assistant engineer to an expedition sanctioned by the late Emperor of Brazil under the direction of Captain Palm, a Swedish Engineer, to explore and survey for a proposed railway from Curitiba in the Province of Paraná to Miranda in the interior Province of Matto Grosso, Brazil. To one of the divisions of the expedition was allotted a section of the work in the valley of the river Ivaity, one of the large tributaries of the river Paraná, and here for nearly two years Mr. Bigg-Wither faced the hardships, difficulties, and perils only known to those who have experienced similar work in the virgin forests and almost unexplored and uninhabited regions of South America. He threw himself heartily into the work, but his staff was destined to much misfortune. Some of its members became incapacitated by ill health, and a large share of the work fell upon his shoulders. He himself more than once nearly lost his life from exposure and privation in the forests, and misadventure in passing the dangerous cataracts of the river, which was the principal means of communication for both the work of the survey and for obtaining supplies.

But the most arduous part of the work was completed before a further break up of his staff occurred. The remainder of the section was completed by other members of the expedition, by that time free to undertake the work, and Mr. Bigg-Wither was chosen to conduct the exploration of an alternative route in the valley of the river Tibagy. Upon the satisfactory completion of his work he returned to England in 1875.

He read a paper before the Royal Geographical Society in June 1876,* descriptive of the Tibagy valley, and subsequently published a spirited and interesting book entitled 'Pioneering in South Brazil,' giving an account of his varied experiences and adventures.

He was elected a Fellow of the Society in 1876.

In 1876 he married a Miss Woodgate, of Pembury, Kent, and remained in England taking pupils in surveying and engineering till 1882, when he entered the service of the Bengal Central Railway Company. In March 1883, he was transferred to Gorakhpur as resident engineer, and from April 1887 until the time of his death was resident engineer of the whole line, responsible for its maintenance, and having charge of new branches under construction. He worked with untiring zeal and energy, and took the greatest interest in his work, allowing nothing to interfere with it; but in the exhausting climate of the plains of India, his already overtaxed strength broke down, under the extra strain of the illness of one of his family. He was ordered home, but sank from exhaustion on board the P. and O. ss. *Assam*, and his body was committed to the deep, a few hours before reaching Aden, on the 19th July, 1890, in the forty-fourth year of his age.

* Published in the 'Journal R.G.S.,' vol. xlv. p. 263, with a map by the author.

REPORT OF THE EVENING MEETINGS, SESSION 1890-1.

Second Meeting, 24th November, 1890.—The Right Hon. Sir M. E. GRANT DUFF, G.C.S.I., &c., President, in the Chair.

ELECTIONS.—Charles Alma Baker, Esq.; Eustace A. Reynolds Ball, Esq., B.A.; William Charles T. Beasley, Esq., M.A.; William Hamilton Briggs, Esq.; Theodore Brooks, B.A.; Arthur William Whately Brown, Esq., M.A.; Rev. Cæsar Caine; William Carmichael, Esq.; Thomas Barclay Cartwright, Esq.; Cecil Carus-Wilson, Esq.; J. Worrell Currington, Esq., D.C.L., C.M.G.; Herbert J. Coningham, Esq.; Randal Cresswell, Esq.; Dr. David Kerr Cross, M.B., &c.; Bernard Vernon Darbishire, Esq., B.A.; John Francis William Deacon, Esq.; J. J. Foster, Esq.; Robert Charles Foster, Esq.; Leopold Grahame, Esq.; Thomas Waring B. Greenfield, Esq.; Henry Holloway, Esq.; Sultan Sayyid Saadat Hosain; Frederick Gordon Hughes, Esq.; John William Hughes, Esq.; Rev. William Hughes; Frederick George Jackson, Esq.; Walter Evans Jackson, Esq.; George Colman Kelly, Esq.; R. T. Kennedy, Esq.; Major Reginald Watkin Edward Kenrick (3rd Gordon Highlanders); Hon. W. J. M. Larnach, C.M.G.; Gybbon M. Le Touzel, Esq.; John Story Masterman, Esq.; J. Stanley Milroy, Esq.; J. K. Moore, Esq.; Charles Morgan, Esq., B.A.; Frederick Thompson Mott, Esq.; Harvey Patterson, Esq.; Rev. Clement Raymond Perry; P. Gower Poole, Esq.; Gerald Herbert Portal, Esq., C.B.; Henry Prince, Esq.; Cyril Herbert Pryor, Esq.; George Ricketts, Esq., C.B.; William Henry Rinder, Esq.; Gilbert Pitcairn Simpson, Esq.; Captain Charles Slack; George Frederick Smith, Esq.; Daniel C. Stevens, Esq.; Harry Swift, Esq.; G. P. Tate, Esq.; Alfred Taylor, Esq.; Edward Cavendish Taylor, Esq.; George Edmeades Tolhurst, Esq.; Michael Tomkinson, Esq.; Robert M. Turner, Esq.; Samuel Kingston Vickery, Esq.; William Weatherly, Esq.; Eugene R. Wethey, Esq.; Alfred Williams, Esq.; John Edward Wood, Esq.; John Woodall Woodall, Esq., M.A.; Captain A. C. Yate, B.S.C.

The Secretary (Mr. H. Seebohm, F.L.S.) announced the following important donations recently made to the Society:—

A case containing 285 photographs taken during the Portuguese Expedition to Muata Yamvo's kingdom, West Central Africa; presented by Captain Carvalho.

An album of photographs of Andorra, with a map; presented by Mr. F. H. Deverell.

Eighty-nine photographs taken in the South of France; by Mr. James Jackson, of the Geographical Society of Paris, and presented by him.

Map of South Australia and the Northern Territory; presented by the Surveyor-General, Adelaide.

The paper read was:—

Matabele and Mashona Lands. By E. A. MAUND, Esq. (*Ante*, p. 1.)

Third Meeting, 8th December, 1890.—The Right Hon. Sir M. E. GRANT DUFF, G.C.S.I., &c., President, in the Chair.

ELECTIONS.—Captain William Codrington Carnegie Forsyth, R.N.; Frank Green, Esq.; Charles Bayley Gutteridge, Esq.; Henry Finnis Blossie Lynch, Esq.; Francis W. Rawlinson, Esq.; Emil Reiss, Esq.; Robert Roy, Esq.; Rev. W. E. Taylor.

The paper read was:—

Explorations in Alaska and N.W. British Columbia. By H. W. SETON-KARR, will be published, with map, in a subsequent number.

PROCEEDINGS OF FOREIGN SOCIETIES.

Geographical Society of Berlin.—November 8th, 1890: Baron von RICHTHOFEN in the Chair.—(1) Dr. Helmunn read a report upon the Eighth International Congress of Americanists, which was held in Paris from 14th to 20th October, and at which he represented the Geographical Society of Berlin. Only a certain number of the questions treated at the Congress were of interest from a geographical point of view: among these may be mentioned the discussion on the origin of the name America which was opened by M. Jules Marcou, who asserted that the name America was derived from a range of mountains in Central America, which in the language of the natives is called Amerique, and that Vespucci never bore the Christian name of Amerigo, because this latter is not a saint's name in the Italian calendar; and further that he changed his name Alberico to Amerigo for the first time after the name by which the New World is now commonly known began to be used, in order to cause it to be believed that the continent was so named in his honour. But M. Govi proved two years ago that the name Alberico is in the Florentine language identical with Amerigo; and that Vespucci, before the year 1500, sometimes subscribed himself Amerigo appears from a letter recently discovered among the archives of the Duke of Gonzaga at Mantua. This point was corroborated by the Spanish Americanist, de la Espada, from letters and pamphlets preserved in the Archiv de las Indias at Seville, in which Vespucci sometimes calls himself Alberico, and sometimes Amerigo. *En passant*, the Spanish savant mentioned the interesting fact that the first of the so-called "quatuor navigationes" was not made by Vespucci at all. M. Hamy adduced a further interesting proof of the incorrectness of M. Marcou's contention, in the shape of a map of the world prepared in the year 1490 by the cartographer Vallescu of Mallorca, on the back of which is a note to the effect that the map was bought in at an auction by the merchant Amerigo Vespucci for 120 gold ducats. Further, the General Secretary of the Congress, M. Pector, pointed out that, according to a communication received from the President of Nicaragua, the range of mountains in question is not called "Amerique" at all, but "Amerisque." After this very thorough discussion of the question, it is to be hoped that the accusations against Vespucci and Hylacomylus may not be heard of again. An important contribution to the cartography of America was furnished by the paper read by M. Marcel upon two globes discovered by him, which date back probably from the year 1513.—Professor Gaffard spoke upon the journeys of the Corte Real family. The supposed journey of João Vaz Corte Real in the year 1464 to the Terra do bacalhao, he showed to have been impossible, and he also threw light upon the discovery of Labrador by Gaspar Corte Real, as well as upon the travels of the two brothers Gaspar and Miguel, who perished in Davis Straits, and who must be regarded as the first victims of Polar exploration and of the problem of the North-west Passage.—M. Marcel made a report upon the condition of the Tierra del Fuegians in the year 1695 as described in the hitherto unpublished reports of two French travellers.

SCIENTIFIC RESULTS OF NANSSEN'S JOURNEY ACROSS GREENLAND.

Dr. Fridtjof Nansen then read a paper on his journey across Greenland, with special reference to the scientific results of the same. By this expedition it is shown that the whole of Greenland south of about 75° north latitude, is covered by an immense unbroken coating of inland ice. How far this covering extends over northern Greenland is not yet accurately known. That it must go beyond 75° is evident from the mighty glaciers which project into the sea along the

whole of the west coast of Greenland; of these the immense glacier at Upernivik shows a movement of as much as 99 feet in 24 hours. Such glaciers must of necessity be fed by an unbroken ice-covering in the interior, because otherwise they would not have sufficient material for their enormous production. Although under 80° north latitude there are large glaciers, like the Humboldt glacier, still the latter appears to have no important motion, and inasmuch as Grinnell Land also is not completely covered with ice, it is quite possible that the extreme north of Greenland, in consequence of the atmospheric precipitation being too insignificant, is no longer wholly overlaid with this ice-covering. The highest point reached by the expedition exceeded 8915 feet, and lies about 112 miles from the east coast and 168 miles from the west coast. But the highest part of the ice does not lie so near to the east coast as might appear from the foregoing. For in the first place, the route of the expedition was not at right angles to the coast, but inclined to the longitudinal axis of the country, the direction being first north-west and then west-south-west; and secondly, the land in the interior rises from the south to the north. Consequently, the highest point of the ice lies, in fact, nearer the middle of the country than would appear from the route. The periphery of the ice-covering corresponds pretty much to the segment of a circle of about 6450 miles diameter. The Jensen journey into the interior gives a circular periphery with a radius of 5560 miles, and Nordenskiöld's journey one with a radius of 14,530 miles. It follows that the upper side of the inland ice forms a remarkably regular cylindrical surface from one coast to the other, although the radii of this cylinder increase considerably from south to north. The underlying land is certainly, as the numerous fjords prove, just as mountainous as Norway. But the fact that the surface of the ice is so regular is due to the pressure of the plastic ice-masses, and the surface of the ice reaches its highest level just where the resistance to this force is greatest. The watershed of the underlying land lies nearer to the east coast than to the west, then the resistance to the pressure of the masses of ice will also be greater on this side than on the west coast, and the high ridges of the ice-covering will also be found to lie between the middle axis of Greenland and the water-divide of the land buried beneath the ice. The thickness of the Greenland ice Nansen estimates at from 5000 to 6000 feet over the valleys of the underlying land. The pressure of a glacier 6000 feet high upon its base would amount to at least 160 atmospheres; the ice-masses must therefore exercise a strong moulding influence upon the land. The inland ice at a short distance from the coast is composed of fine dry snow, on the top of which the sun in summer only is powerful enough to form a thin melting crust. The ice-poles six feet long could be driven into these masses without striking firm ice. The daily variation in the temperature amounted, in the month of September, to from 36° to 45° (Fahr.); the annual variation must be enormous. The moisture of the air is very great; with few exceptions it amounted to between 90 and 100 per cent. The number of days of atmospheric precipitation is also large; of the forty days occupied by the expedition in crossing the ice, four were rainy, snow fell on eleven, and hail on one. Inasmuch as there is now no melting of the ice in the interior of Greenland, and evaporation also is almost nil, the chief factor in preventing the further increase of the ice-masses, apart from the great part which is played by the movement of the ice-masses in the direction of the coast, is apparently to be found in the "terrestrial heat." Given the mean annual temperature on the surface of the inland ice at - 22° (Fahr.), and the geo-thermic scale of depth of the ice at about 55½ feet per 1° (Fahr.), the temperature of the ice would, even at 3000 feet, stand at melting-point. In any case an active melting process goes on at the bottom of the ice, and rivers pour forth into the sea from under the ice in winter as well as in summer. Nansen

himself had the opportunity of observing this during the most rigorous winter. These streams, which must flow under the enormous pressure of the ice-masses, are powerful eroding agents; the formation of the "asar" in Sweden and of the "kames" in Scotland, England, and Ireland, are apparently to be accounted for in this way.

— December 6th, 1890, Baron VON RICHTHOFEN in the chair:—

LAST JOURNEY OF DR. L. WOLF IN THE SOUTH NIGER BASIN, AND HIS
CONFIRMATION OF THE OBSERVATIONS OF DR. DUNCAN.

Dr. von Danckelman read a report upon the last journey of Dr. Ludwig Wolf, the explorer of the Kassai and Sankuru, who met with his death in June 1889, while travelling in the south Niger basin. Dr. Wolf had in May 1888 founded in the "Hinterland" of Togo, the station of Bismarckburg, which is situated in Adeliland, a region never before trodden by a European. There he succeeded in settling certain internal tribal feuds, and in opening up to commerce the routes to the coast. This accomplished, he determined to bring about peace and order on the eastern confines of Togoland, the inhabitants of which were continually being menaced with raids from Dahomey and with this object he decided to pay a visit to Abome, the capital. But the fact that a direct journey thither would have produced among the people of Adeli and Atakpame, who are the sworn foes of Dahomey, the greatest mistrust as to the *bonâ fide* character of his intentions, and the desire to accomplish an important piece of exploration by opening up the almost unknown country lying to the north-east of Bismarckburg, induced him to plan a journey through the south-east Niger basin, by means of which he would eventually reach Abome from the east, after having made a circuit of Dahomey in the north. On the 22nd of April, Dr. Wolf set out with a party of thirty-two men in a north-easterly direction. The first three days' march led him through a very hilly district, but after reaching the Angaë, an important tributary of the Monu, the route lay for the most part over gently undulating country, where travelling was easy. On the 1st of May he arrived at Paratau, the chief town of the important kingdom of Chautjo, the majority of the inhabitants of which have already become converts to Mohammedanism. Here, as well as in the kingdom of Sugu, situated further to the north-east with its capital Wangára, the larger townships are surrounded by strong mud walls, often of very considerable dimensions, within which there are as many as fifteen villages, with large open spaces, on which stand great trees with spreading branches. The traveller was compelled to stay three weeks in Wangára on account of the Mohammedan fasts, before he was able to proceed further to Barbar or Bariba, called by the Hausa, Borgu. On the 7th of June his horse fell with him. This accident appears to have caused a slight concussion of the brain. Two days later he was seized with a dangerous fever, so that he was only able to push forward by short days' marches and with frequent interruptions. With iron will, however, he roused himself to repeated effort, until his strength at last failed him, and he remained in the little village of Dali, only two-and-a-half hours distant from Perere, the capital of a portion of Borgu, and two days' journey from Niki; here, on the 26th June, he breathed his last, after having on the morning of the same day recorded in his diary the temperature of his body. Even during the last day's march, when he could no longer ride, but could only be carried forward reclining in a hammock, he was careful to note down the duration of march, and the direction of the compass. His interpreter, Hardesty, a freed slave's son, who after having been educated in a mission school in Sierra Leone, had been first of all a Protestant, then a Catholic missionary and school teacher, and finally, a trader in Little Popo, behaved shame-

fully after the death of the traveller. He disposed of himself for six months with the caravan now bereft of its leader, disposed of the watch and signet ring of the deceased traveller, and squandered the goods of the expedition. In order to protect himself from the consequences of his misdeeds, he obtained from a great fetish priest a fetish which was to shield him on his return to Togo, and to cause his robberies to remain undiscovered. This naturally availed him nothing; he was sent as an impostor from Bismarckburg to the Cameroons, and sentenced to many years' hard labour. The diaries and itineraries of the traveller were most fortunately preserved by his faithful personal attendant, whom he brought from the Congo to Europe, and educated there. The geographical significance of Wolf's journey lies mainly in the fact that it gives unexpected confirmation to the hitherto much-doubted journey of Duncan to Adofudia. Duncan, after having taken part in Allen's Niger expedition of 1841, undertook, with the assistance of the Royal Geographical Society, in 1845, a journey from Whydah by way of Abome to the north, in the course of which he penetrated as far as the mysterious town of Adofudia, where it was stated he succeeded in attaining the main object of his expedition, namely, the collection from so-called eye-witnesses of news as to the fate of Mungo Park. It was no less a person than Dr. Barth who, in the first instance, threw doubt upon the reality of Duncan's journey. For if, it was said, a town called Adofudia really existed in the place where Duncan had indicated, i.e. under 13° N. lat., Barth must have heard of it in his travels through the south Niger basin. But that was not the case, and because Duncan, on his own showing, travelled over sometimes quite impossible distances, e.g. 44 miles a day, Barth felt justified in throwing doubt upon the whole of Duncan's journey. But the very objections which Barth raised against Duncan on the ground of his own experience, in the light of Wolf's expedition go to confirm the observations of the much maligned English traveller, as Dr. Danckelman proceeded to show. Duncan found, after he had passed the Kong Mountains, comparatively level country. Wolf's measurements for altitudes and his descriptions of his route give the same result. Duncan pictures the towns encircled by mud walls or thorn hedges, and calls attention to the abundance of horses, of which only stallions are used for riding purposes; the horses, when feeding in the stable, are kept in the entrance halls of the large houses, where they are tied by one of the fore feet to a low stake. He describes the ever-expanding influence of Islam as the traveller proceeds further north; the two elements of which the population is composed; the one, the heathen element, which is more or less in subjection, stands low in the scale of civilisation, and in many places still goes quite naked, and the other, the ruling class, descended from the Fulbe, which wears many coloured garments made of native cotton, is devoted to Islam, and includes the civilised and commercial portion of the population. In all the large towns there are two Mohammedan priests, who exercise a great influence, even if the chiefs happen to be still heathen. The large market-places covered with shady trees, which are situated within the walled towns; the frequent presence of oil-palms, a fact about which Barth was specially disinclined to believe Duncan; these are details which the English traveller could only have depicted from his own personal observation of the conditions of these regions, and which are confirmed by Wolf's diaries. Nay, more. Duncan speaks of a river Offo, which he crossed, and Wolf, on the 8th June, 1889, also crossed a river Ofó. In the itineraries to Abome made by Wolf during his stay in Wangára, there are the towns of Gurruba, Agua, Chokobo, and Esette, which at once recall the names mentioned by Duncan of Gruba, Akwaba, Soglogbo, and Setta. On the basis of Wolf's route it may be supposed that the Adofudia of Duncan, which has for so long been shifted about on the maps of Africa, and which apparently, owing to the many wars and

disorders of those regions, no longer exists, or has changed its name, as frequently happens in these countries—for Wolf met no one who knew the name—is to be fixed approximately at about $10^{\circ} 30'$ N. lat. Dr. Wolf's travels covered a far greater extent of country than has been supposed; his grave is not in Dahomey, but in the notorious Barbar or Borgu. The Barbar are the greatest robbers of the whole south Niger basin. The Hausa caravans from Sokoto, Kano, and Bornu, travelling to Salaga and Kintempo, form their booty. The state of affairs in this region brings to mind the doings of the robber knights of the middle ages in Germany. The sons and relatives of the chief men are the very men who most wantonly indulge in this predatory mode of life. Not unfrequently the most important caravan routes are closed through the audacity of these robber bands, and the Hausa caravans are obliged to make wide detours. In spite of the fact that Dr. Wolf did not attain his object, his journey will always be regarded as an important contribution to the exploration of the Western Sudan.

DR. HETTNER'S JOURNEY IN SOUTH PERU AND BOLIVIA.

Dr. Hettner then spoke upon his geological and ethnographical expedition in Southern Peru and Northern Bolivia, which was undertaken with the assistance of the Geographical Society of Berlin. From Mollendo the traveller arrived after an eight hours' railway journey at Arequipa, whence Lake Titicaca is reached by the line across the Western Cordilleras, on which only two trains [weekly communicate with Puna. A branch line, starting from Juliaca, is to be continued to Cuzco, but it is at present only half finished. Two small steamers ply on Lake Titicaca. These vessels were conveyed to the lake on the back of mules before the completion of the railway, and in conjunction with the railway trains they enable the traveller to reach Chilulaya, situated at the south-eastern extremity of the lake, in fifteen hours. From this point La Paz, the most important town in Bolivia, is distant a day's coach journey. But the traveller who desires to make himself thoroughly acquainted with the country and people, will do well to make but occasional use of railways and steamboats, and to journey mostly on mules. This mode of travelling is difficult, but not dangerous, for the population is, generally speaking, peaceable and well disposed. There are hotels in the large towns only; in the smaller places the traveller must have recourse to the hospitality of the burgomaster, clergy, or planter, and at times will even have to pass the night in a wretched Indian hut, in which nothing is to be found except what the traveller himself brings with him. The coast presents mostly steep cliffs, rising abruptly in several steps to a terraced strand from 600 to 900 feet high, which was formerly covered by the sea. Behind this follows the range of the coast Cordilleras from 3300 to 4000 feet in height, which is connected in places by cross ridges with the Cordilleras proper, but is mostly separated from the latter by a table-land, which stretches north and south for an immense distance, and has an altitude of from 3000 to 5500 feet. It is only on the coast terrace and on the front portion of the coast Cordilleras that, under the influence of the thick winter mist, a herbaceous vegetation thrives during several months. This causes a general movement of the herds of cattle away from the mountains, which are at this season dry. But it sometimes happens that this mist disappears suddenly, and then numbers of cattle perish. Throughout the whole length of the tableland rain only falls every eight or ten years. Consequently this region is a perfect desert; the sky is a magnificent blue, the sweltering heat of the day gives place at night to a perceptible degree of cold. Although it cannot with certainty be said that any marine remains have been found on these plains, it is still in the highest degree probable that they are an old sea-bed.

Further south these plains contain in the neighbourhood of Tarapaca large salt deposits, on the western border of which are found the famous nitrate deposits. The journey through these regions on mule-back is very fatiguing, and is at the present time not often undertaken. There is considerable variety in the deeply eroded valleys of the rivers flowing down from the Western Cordilleras. At the bottom of the valleys green fields and human settlements alternately meet the eye. The sides of these valleys, which are often 3000 feet deep, present the most dazzling orange-coloured tints, characteristic of the desert landscape; in some places the sides form compact walls with the most precipitous slopes, in others they have been disintegrated into columns and pillars. In the valleys lucerne, as fodder, the vine, olive, rice, and sugar-cane are cultivated. To supply the lack of water in the pampas by artesian wells, as is hoped, appears to be out of the question, because there are no springs in the sides of the valleys. The inhabitants of the coast region, the Costeños, are a mixture of the Spaniard and the Indian: the further north, the more the negro element is represented. The language spoken is Spanish, and the Costeño consequently looks down with contempt upon the people of the Sierra, where the Quichua and Aymara languages prevail. The Costeño is frank, light-hearted, amiable, and hospitable; the weak points in his character are untruthfulness and want of depth and moral earnestness. In the rear of the great table-land rise the Western Cordilleras. In spite of their important altitude, they present only in a few places a grand appearance. The panorama obtainable from Arequipa, a city of 40,000 inhabitants, is the most beautiful. Immediately behind the town, which lies on a tufa plain covered by means of clever irrigation with green meadows and plantations, three mighty peaks tower aloft—viz. Misti (19,000 feet), with its regularly shaped dome; Pichu-Pichu, with its elongated mass, somewhat lower than Misti; and on the left of Misti, and considerably overtopping it, the giant form of Charachani. Still further to the left the eye catches in the distance a white cone of snow, which has been incorrectly designated Coropuna, but is in reality called Ampato, and reaches an altitude of nearly 23,000 feet. Dr. Hettner made an ascent of Charachani in October 1889. It appears that this peak, which is over 19,500 feet high, has not only been frequently ascended by the Indians, who obtain sulphur there, but there was found upon the topmost summit a well, walled round evidently by the Incas, which was intended to collect the snow. Magnificent also is the prospect over the valleys, which cut into the Western Cordilleras, with their mighty and mostly bare walls, often 10,000 feet deep. The ascent of the Cordilleras to the town of Puna brava is steep. Travelling over these high plains—composed of tufa and other volcanic rocks and overgrown with stiff *ischu* grass, where even the miserable Indian huts are only met with at long intervals, and where browsing herds of cattle, sheep, and alpacas are left in sole possession—is by no means pleasant. Heavy rains and snowstorms add to the desolation, and the traveller is conscious of a great sense of relief when he descends from these regions on to the plateau of Lake Titicaca, although the latter is still 12,500 feet above the sea-level. The lake, which is equal in size to the Kingdom of Saxony, is surrounded by numerous villages and small towns. In sheltered places some low shrubs thrive. Wheat only flourishes under the warm influence of the great water surfaces, but the cultivation of potatoes, millet, and barley, and the extensive meadow flats, on which oxen, sheep, and llamas pasture, suffice to supply the wants of a dense population, and there is no ground for the supposition that a milder climate prevailed here at the time of the Incas. The numerous islands, and the peninsulas narrowing the lake, give it a picturesque beauty, which is enhanced by the proximity of the snow-clad crown of Illampu. From the terminus of the steamboat journey the route proceeds in a south-easterly direction from Chililaya over the

plains, which border on the lake at the southern end, parallel to the snow-capped summits of the Eastern Cordilleras. Suddenly the traveller finds himself standing upon the edge of a deeply eroded valley, at the bottom of which, 1600 feet below him, lies La Paz, the largest city in Bolivia. The sides of the valley reveal horizontal strata of shingle, sand, and clay, with veins of fine volcanic tufa, which, as the contiguous range of the Eastern Cordilleras is quite free from volcanic formations, must have come from one of the volcanoes of the Western Cordilleras. These valley walls are the result of the action of an anterior lake (Titicaca), which, with a higher water-level, at one time extended as far as this point. The river La Paz, a tributary of the Amazons, has here broken through the natural watershed of the country, the Eastern Cordilleras, and has usurped a portion of the basin of Titicaca. Further north another river, the Rio Mapiri or Sorata, also cuts through the Eastern Cordilleras near the foot of the highest peak, Illampu, and forms landscapes of marvellous beauty. In the Peruvian Sierra proper, further to the north-west, there are no more tablelands without any river outlets. All the rivers (the Vilcanota, Apurimac, Mantaro, Marañon, &c.) penetrate the Eastern Cordilleras, but from Ecuador onwards, where the west coast ceases to be rainless, rivers break through the intervening country to the west also. Although the Western Cordilleras, the Titicaca plateau with its intersecting valleys, and the Peruvian Sierra proper differ from each other, they agree as regards the population. Among the Serranos, the Spanish descendants and hybrids form but a fragment of the population; the bulk are pure Indians, genuine descendants of the Incas, among whom, under the guise of Christianity, many heathen customs are still practised; they speak not Spanish, but Quichua and Aymará. They are either attached as slaves to the haciendas or else form independent communities, but in both cases are at the mercy of the whites, and are regarded by the latter as fair booty. The prevailing and ruling races stand opposed to each other, full of mutual distrust, and another terrible insurrection, like that which took place at the end of the last century under Tupac Amaru, a descendant of the Incas, appears to be not wholly improbable. The Indians are in consequence of their long bondage a stupid and in some parts almost brutalised race. The stagnation in the domestic life of the Sierra is very great, trade is restricted, owing to distance and the peculiar formation of the country, and the Sierra possesses, besides the minerals which are worked at a few places, no products which it would pay to export. In Montana, on the eastern slopes of the Eastern Cordilleras, commences the natural wealth of the country. Rain falls throughout the whole year in great quantity. With the rain brushwood first makes its appearance, and then luxuriant tall forests. Wheat no longer flourishes here, because of the great humidity, but maize and barley take its place. Below 6500 feet the tropical products of cultivation, coffee, sugar-cane, cacao, commence. The cultivation and exportation of cinchona no longer pays since the cinchona trees have been cultivated in India and the Dutch East Indies. The route from Cuzco through the Vilcanota valley to the Montana, along one of the roads made a few years ago, presents the most magnificent specimens of valley scenery which are to be found in the Cordilleras. Steep walls of immense height are clothed with luxuriant primeval forests; through the side valleys glimpses are obtained of the white snow crests of the Cordilleras, until at length in the broadening valley of Santa Ana the haciendas with their cocoa and sugar-cane plantations are reached. Further down follow virgin forests and wild Indians. In the valleys of Pancartambo, where at the time of the Spaniards hundreds of flourishing haciendas might have been seen, not a single one now exists; they have all fallen victims to the disunion of the colonists and to the attacks of the Indians. The most beautiful and fertile district, but at the same time the most remote, of the Peruvian and Bolivian Andes, viz. the eastern slope,

has only here and there been taken possession of by civilised man, the rest belongs to the wild Indians, who have not been driven back in the present century, but, on the contrary, have gained ground. Only in a few places is it possible to penetrate to the eastern plains without coming into hostile conflict with them.

Geographical Society of Paris.—November 7th, 1890: Vice-Admiral VIGNES, Vice-President of the Society, in the Chair.—It was announced that a member of the Society, M. Charles Grad, who died in July last, had bequeathed to the Society the sum of 200*l*.

CLIMATOLOGY.

M. A. Penck, Professor of Geography at the University of Vienna, sent an interesting memoir on climatology, calling attention to certain conclusions arrived at by Brückner in his recent work on climatic variations. Brückner finds that humid and dry periods of about thirty-five years in length alternate. In Western Europe and the eastern part of the United States the rainy years yield nearly a sixth and even a fifth more rain than the dry years, but in Siberia and the far west of North America, a third and even a half more. The great general migrations of peoples can be connected with these periodical changes of climate. The natural migratory instinct in man is not sufficient to induce him, where he cultivates the soil, to leave the tilled ground; he has been driven by climatic variations to quit the centres of continents for the lands lying nearer the ocean, where the periodical changes are not so violent. This accounts for the situation of the present centres of civilisation on the shores of the North Atlantic, the two sides of the North Pacific, the northern shore of the Indian Ocean, as compared with the "Mediterranean" civilisation of the Roman epoch and the "continental" civilisation of still earlier times. Since 1870 the world has been passing through one of the humid periods which has produced bad harvests in the oceanic regions of Europe, but in continental centres a great increase in the fertility of the soil; and it is curious that this period has witnessed great tracts of country in the latter regions, e.g. the prairies of the Far West of America, a large portion of Russia and Hungary, and the Deccan, brought under cultivation. During the first two decades of the next century a dry period may be expected, when the annual amount of humidity will be 15 or 20 per cent. less than it is to-day, but much more in those continental regions which serve as the granaries of Europe.

DISTRIBUTION OF ATMOSPHERIC PRESSURE IN RUSSIA.

A communication from M. Venukoff announced that the Geographical Society of Russia had just published General Tillo's important work on the distribution of atmospheric pressure in the territory of the Russian Empire and on the Asiatic continent. It is to be observed that low annual pressures are only met with in the north-west part of Russia in Europe, viz. in Lapland, Finland, and the Baltic provinces; in the rest of the empire high pressures, above 29·9 inches (760 millimetres) predominate; in the vicinity of Irkutsk they reach 30·2 inches (767 millimetres). The winter isobars, however, in the month of January especially, are very high, the mean height of the barometer at Irkutsk attaining the enormous figure of 31·3 inches (795 millimetres). Here lies the centre of the cold winds that spread themselves over the whole of Russia, on the coast of the Sea of Japan as the north-west currents, and on the Baltic Sea as the north-east currents. M. Venukoff also communicated the results of the first year's soundings in the Black Sea. Sixty depths were ascertained, and the drag-net thrown twenty times. The greatest depth

found was 1422 fathoms, on the line connecting Sebastopol with Sinope, nearer to Anatolia than to the Crimea.—M. Fr. Haas, French Consul at Hankow, wrote on 20th July to announce his intention of exploring, in the following October, the Upper Yang-tse-kiang from a geographical and commercial point of view.

THE VEDDAS OF CEYLON.

M. Em. Deschamps transmitted from Mahé, on the Malabar coast, some interesting information respecting the Veddas, descendants of the first known inhabitants of Ceylon. They are probably the "Yakkas," or "demons," of whom the ancient works and legends speak, an appellation derived from their demoniacal cult, and which was probably changed by the first conquerors of the island into that of "Veddas" (hunters). They inhabit a belt of forests lying on the eastern confines of the central province. As a race they are rapidly disappearing, and now number only 200 or 300. Their villages lie several miles apart, and consist of one or two huts, formed of the branches and bark of trees; some, when the rains come on, find shelter in the rocks, and have received the name of Galla-Veddas. Their weapons, consisting of bow, arrows, and hatchet, are their principal goods. They are great hunters. The Veddas never speak, unless absolutely obliged, and do not know how to laugh. Their manner of speech is brusque and their language is very poor, being deficient in whole series of words, i. e. trees, plants, colours, &c. Although living in the midst of a population which is at once polygamous and polyandrous, they remain monogamists. The baptism of children is the only ceremony to which they attach great importance. They have no chief or social organisation. Their religion consists in fear of the demons, of which the jungle is supposed to be full. The dead are now buried in the forest; not long ago it was the practice to simply abandon the corpses. The Vedda never betrays any sentiments; anger astonishes, and laughter exasperates him. Dancing is his favourite occupation. Doctors and medicines are unknown; the people meet to dance away the devil of a sick man. The men are rather small, strongly built; their lower limbs badly made, and not well proportioned; hair black and coarse; eyes black and sparkling, with a fierce look; forehead straight and broad; nose broad; the general appearance of the countenance not disagreeable; their body is maroon in colour, and is repulsively dirty. The women are small, and possess few of the attractions of their sex. Their clothing, like that of the men, is of the scantiest.

THE CLIFF DWELLERS OF THE SIERRA MADRE.

M. Hamy called attention to Lieutenant Schwatka's discovery two years ago, in the mountains of the south-west of Chihuahua, of a people still making their abodes in holes dug out of the rocks, and stated that an expedition under the leadership of M. Lühmoltz, of Christiania, had recently been despatched to the barrancas of the Sierra Madre with the object of studying this curious tribe of people. Several naturalists and an archæologist accompanied the expedition.

NEW GEOGRAPHICAL PUBLICATIONS.

(By J. SCOTT KELLIE, *Librarian R.G.S.*)

EUROPE.

Carbon, Victor.—Autour des Balkans. Paris, Augustin Challamel: 8vo. pp. 345.

An interesting account of a journey along the coasts of Dalmatia and Istria, but its pages are somewhat disfigured by personalities which are out of place in a volume of travels.—[R. L. P.]

Crawford, Oswald [C. M. G.]—Round the Calendar in Portugal. Illustrated by Miss Dorothy Tennant, Mrs. Arthur Walter, Miss Alice Woodward, Miss Winifred Thomson, Mr. Tristram Ellis, Mr. Ambrose Lee, and the Author. London, Chapman and Hall, 1890: 8vo., pp. viii. and 316. Price 21s. [Presented by the Publishers.]

Mr. Oswald Crawford, who is British Consul at Oporto, has resided for twenty years in Portugal, during which he has seen a great deal of the country and people, and is probably the greatest English authority on the subject. In the present volume he treats chiefly of rural matters, more particularly of the ways of the people, describes the kind of "out of doors" there is in Portugal, taking his readers month by month round the whole circle of the year. The work affords a very complete idea of the inside of Portuguese rural life; it contains numerous appropriate, if somewhat rude illustrations.

Hare, A. J. C.—North-Eastern France, South-Eastern France, South-Western France. [3 vols.] London, G. Allen, 1890: cr. 8vo., maps and illustrations. Price 10s. 6d. each. [Presented by the Publisher.]

Travellers near home grow annually more gregarious. Mr. Hare's works are useful to the exceptions, and ought to serve to multiply them. The three volumes dealing with three-quarters of France (North-Western France remains to be published) are perhaps the best of the series. Mr. Hare has observed more exactly the legitimate limits of quotation; he has seen much himself, and he has furnished an ample supply of excellent woodcuts from his precise and pretty architectural sketches.

The illustrations show the author's point of view. He appreciates the picturesque rather than the sublime or romantic, and likes best in Nature what Man has added to it. He is the "cruiser-on-wheels" rather than the footpath tramp, and France is a country well suited to such an explorer. It is to be regretted that the characteristic physical aspects of the different provinces are not more prominently brought out. Of course, a work of this nature must be open to correction and addition in detail. Lists of recommended books of travel in France would be a useful supplement, and English travellers need to be told how cheap and easy to be procured are Government local maps in France. The contrast with the arrangements in force in England is striking.—[D. W. F.]

Hirschfeld, [Prof. Dr.] Gustav.—Bericht über die Fortschritte in der geographischen und topographischen Kenntniss der alten griechischen Welt. 8vo. [Presented by the Author.]

Nadarov, J. P.—The Southern Ussurian District at the present time. (Communicated at a Public Meeting of the Russian Imperial Geographical Society, of 19th April, 1889.) (Translated by Lieut.-Col. J. C. Dalton, R.A., D.A.A.G.) From the Proceedings of the Russian Imperial Geographical Society, vol. xxv., 1889, No. 3. London, Harrison & Sons, 1890: folio, pp. 19, map.

Schulze, [Dr.] Erwin.—Ueber die geographische Verbreitung der Süßwasserfische von Mitteleuropa.—Forschungen zur deutschen Landes- und Volkskunde . . . herausgegeben von Dr. A. Kirchhoff. Fünfter Band, Heft 2. Stuttgart, J. Engelhorn, 1890: 8vo.

[Swiss Triangulation.]—Internationale Erdmessung. Das Schweizerische Dreiecknetz herausgegeben von der Schweizerischen Geodätischen Commission. Fünfter Band. Astronomische Beobachtungen im Tessiner Basisnetze, auf Gâbris und Simplon; definitive Dreiecksseitenlängen; geographische Coordinaten. Zurich, S. Höhr, 1890: 4to., pp. 197, map.

ASIA.

Caine, W. S.—*Picturesque India*. London, G. Routledge & Sons, 1890: 8vo., pp. xlv. and 624. Price 10s. 6d. [Presented by the Hon. G. N. Curzon, M.P.]

This volume is intended as a guide to the ordinary traveller in British India who is content to keep to the beaten tracks. It, however, embraces a large portion of the country, and describes most of the principal places in India, together with their chief sights and objects of interest, hotel accommodation, and other useful matters. In the introduction Mr. Caine gives some hints as to outfit, steamship fares, hotel charges, &c. One chapter deals with Ceylon. The last chapter, descriptive of the north-west frontier of India, is from the pen of the Hon. G. N. Curzon, M.P. An important feature of the volume is the illustrations which, apart from the text, convey a good idea of the buildings, scenery, types of nationality, &c. There are also two good maps of Northern and Southern India, specially prepared by Messrs. W. and A. K. Johnston, with the railways completed to January 1890.

Hill, Gray.—*With the Beduins: a Narrative of Journeys and Adventures in untraversed parts of Syria*. London, T. Fisher Unwin, 1891, [1890]: 8vo., pp. 320, map and illustrations. Price 15s. [Presented by the Publishers.]

This is a lively narrative of the difficulties and dangers which now attend travel in Syria beyond the Jordan, a region which, owing to the decay of Turkish authority, is yearly becoming less accessible. The author dwells more on the incidents of his journey than on the sites visited, and little new geographical information will be found in his pages; those that describe how he and his wife were held to ransom by the Kerak Arabs are the most interesting. The heroic, not to say Quixotic, devotion of the English missionary and his wife whom he found in this robbers' den deserved to be recorded. Mr. and Mrs. Gray Hill's travels, made in three seasons, embraced Jerash, Es Salt, Bozrah, and Palmyra. Owing to being accompanied by attendants inimical to the Druses, they were unfortunately prevented from entering the Jebel Hauran, the eastern flanks of which still await careful exploration.—[D. W. F.]

[Rockhill, W. Woodville.]—*An American in Tibet. An Account of a Journey through an Unknown Land*. [From the 'Century Magazine,' Nov. 1890.] 8vo., map and illustrations.

AFRICA.

Deportes, Commandant V.—*À propos du Transsaharien-Extrême-Sud de l'Algérie. Le Gourara, le Touat, In-salah, Le Tidikelt, Le pays du Touareg-Hoggar, L'Adrar, Tin Bouctou, Agadès. Avec Carte au 1:800,000*. Alger, P. Fontana et Cie., 1890: 8vo., pp. 473.

The author styles his work as the indispensable complement of his map. He does not attempt anything like a continuous narrative, but gives a series of itineraries. The subject is divided into three portions:—

1. El-Golea and its territory.
2. Le Gourara, le Touat, le Tidikelt, and the routes between them.
3. The country of the western Touareg.

These are followed by notes on the caravans, called "Akabar," proceeding from Acabli to Timbouctou.—[R. L. P.]

Ellis, A. B.—The Ewe-speaking Peoples of the Slave Coast of West Africa, their religion, manners, customs, laws, languages, &c. London, Chapman & Hall: 8vo., pp. viii. and 331. Price 10s. 6d. [Presented by the Publishers.]

Major Ellis is known already as an ethnologist by his book on the Shi-speaking peoples of West Africa. The Ewe-speaking peoples, to the west of Dahomey, are the neighbours of the former. We do not know that Major Ellis has ever travelled among the Ewe-speaking peoples, but he brings together in the volume a great deal of useful and interesting information on all aspects of their beliefs and their life. An appended chapter contains a summary of the history of Dahomey.

Jephson, A. J. Mounteney.—Emin Pasha and the Rebellion at the Equator. A story of nine months' experience in the last of the Soudan Provinces. With the revision and co-operation of Henry M. Stanley, D.C.L. London, Sampson Low & Co., 1890: 8vo., pp. xxiv. and 490. Price 21s. [Presented by the Publishers.]

Happily Mr. Jephson's volume is free from any of the unhappy incidents and disputes which mar most of the other literature of the Emin Relief Expedition. It will be remembered that when Mr. Stanley returned to the forest a second time to seek for the rear column, Mr. Jephson was left to accompany Emin to Wadelai for the purpose of getting Emin's people to come away. The main details are well known; but Mr. Jephson is able to tell us much that enables us to understand the peculiar position of Emin, and his hesitation to abandon his province. It was evident that while many of his people continued loyal, mutiny was widespread, and that sooner or later the Mahdists would have overrun the province. Mr. Jephson adds much to our knowledge of the geography of the Upper Nile, and especially of the condition of the various stations. He enables us to realise how much has been lost by the inevitable abandonment of the province, and how hopeful would be any serious effort to develop its resources. All the ground around the stations was in a state of flourishing cultivation, and with a firm hand over the unruly Egyptian soldiery, the natives around might have been weaned to civilisation. Mr. Jephson saw a good deal of the Baris, and gives a useful and interesting summary of what is known of this people from his own observations and those of others. There are several excellent illustrations and a useful map.

[Johnston, H. H.]—The Development of Tropical Africa under British Auspices. An Address delivered to the Chamber of Commerce at Liverpool. [From the 'Fortnightly Review,' Nov. 1890.] 8vo.

[Peters, Carl.]—Stanley and Emin Pasha. [From the 'Contemporary Review,' Nov. 1890.] 8vo.

Troup, J. Rose.—With Stanley's Rear Column. London, Chapman & Hall, 1890: 8vo., pp. x. and 361. Price 16s.

Mr. Rose Troup's narrative is an important contribution to the history of the Emin Pasha Relief Expedition. It would however, be out of place, in these pages, to discuss the personal matters with which the volume is mainly occupied. Mr. Troup has appended to his book the official correspondence connected with the Emin Pasha Expedition.

Ward, Herbert.—Five Years among the Congo Cannibals. London, Chatto & Windus, 1890: 8vo., pp. xxxiii. and 308. Price 14s.

Though Mr. Ward was a member of the Emin Relief Expedition, happily, like Mr. Jephson, he has little to say about the mistakes of the rear column. He was in the Congo from 1884 to 1889, and had opportunities of visiting all parts of the river and the countries and peoples on its banks, up to Stanley Falls. During this time Mr. Ward kept his note-book diligently, and took many sketches. The result is a readable series of sketches of life on the

Congo river, and more especially of the ways of the various types of natives met with up and down the river. The book abounds with many excellent illustrations.

White, Arthur Silva.—The Development of Africa. Illustrated with a set of fourteen maps specially designed by E. G. Ravenstein. London, Philip & Son, 1890: 8vo., pp. xi. and 343. Price 14s. [Presented by the Publishers.]

In this volume Mr. White, from an examination of the physical and political phenomena of Africa, has sought to deduce the general laws that should govern its development. The book has been written, Mr. White states, to meet the requirements of the general reader. In a series of chapters he deals with mountains, lakes, and rivers; climate and cognate phenomena; the indigenous population; Islam and Christianity; the traffic in slaves; progress of exploration; commercial resources; the European domination; political partition; summary and conclusion. Mr. White has done a useful service in bringing under one purview the salient facts of African geography in their bearings on the development of the continent. The maps by Mr. Ravenstein are a most valuable addition to the book, and in conjunction with his notes, form a mine of accurate information on African geography.

These maps are the following:—Height of Land (contoured map); River-Basins and Ocean Currents; Mean Annual Temperatures; Mean Annual Range of Temperature; Annual Rainfall; Geological Sketch; Zones of Vegetation; Commercial Products; Density of Population; Languages; Religions, and Missionary Stations; Progress of Exploration; Political Partition; and Forms of Government.

ARCTIC.

Nansen, Fridtjof.—The First Crossing of Greenland. Translated from the Norwegian by Hubert Majendie Gepp, B.A. With maps and illustrations. London, Longmans, Green, & Co., 1890: 2 vols. 8vo., pp. xxii. and 510, x. and 509. Price 36s. [Presented by the Publishers.]

In these volumes Dr. Nansen renders an account of the journey made by him across the glacier-clad interior of South Greenland in 1888, which is substantially an amplification of the address that he delivered to the Royal Geographical Society and others upon his return. The essential part of it is already known, but in its extended form it deserves and will doubtless find a wide circle of readers, on account of its being a full and authentic record of a journey which, in its way, is positively unique.

The bare statement of the scheme of this journey, as originally projected, is enough to take away the breath of most people. Dr. Nansen deliberately proposed to make for the stream of ice which permanently drifts down the East Coast of Greenland, on board a steamer. This stream of ice has frequently been found impenetrable by ships. In about N. lat. 66°, he then intended, should the ice be impenetrable by the steamer, to be cast adrift, on board an open boat, which he hoped to be able to drag over or to force through the floes, and so get to land. The boat was intentionally small and frail, and could therefore carry little. Upon reaching the land, which was barren and inhospitable to the last degree, he proposed to penetrate and cross a continent which, so far as was known, was absolutely covered by snow and ice, and unable to yield either shelter or sustenance; and, after dragging sledges for a distance estimated at 400 miles, to descend upon the Danish colony of Christianshaab,* and to return by the last ship to Europe, the date of its sailing not being known, because it was not fixed.

The opinions of the world in general about this scheme are thus stated by Dr. Nansen:—"Most persons who heard of it considered it simple madness,

* The term "colony" may perhaps lead some to suppose that this is an important place. Christianshaab consists of two or three low wooden shed-like houses, and a score or two of Eskimo huts. At a short distance, like most of the Greenland settlements, it is distinguished with difficulty.

asked what was to be got in the interior of Greenland, and were convinced that I was either not quite right in the head, or was simply tired of life." Undeterred by adverse criticism, and undismayed by want of sympathy, he went his way and carried out his programme. He did actually get to the desired latitude on board the steamer; the ice-stream, as everyone expected, proved impenetrable; he was put out into his boat, and, as every one except perhaps himself expected, he was drifted in or upon the floes, far to the south; and then, when only a few days from succour, food, and shelter, he did what no one expected, turned his face to the north, and in eleven days advanced more than others have done on the same coast in a season. On August 15th, or very much later in the year than had been intended, they commenced their overland journey, and by the 26th Nansen came to the conclusion that they could not reach Christianshaab, and shaped a course for Godthaab. On August 31st it was recorded that land was seen for the last time (on the eastern side of Greenland), but long prior to this the whole country was found to be under ice, with the exception of some mountain tops (*nunataks* as they are called) appearing like stray islands amid the general desolation. Strangely enough, these seem to have been avoided and so we are not informed whether they, like their miniature relatives in the Alps and elsewhere, have their fauna and flora, and whether they have escaped the general abrasion, or have, in earlier times, also been wrapped in the icy mantle.

For twenty days they were out of sight of land. "All this time life was simply inordinately monotonous, with not a trace of any important occurrence." No geographical information is recorded, for there was none to record. On the afternoon of September 19th they saw some mountains on the west coast, five days later they reached the edge of the ice, and on September 26th came to the end of a fiord leading towards Godthaab. In three days more they built a boat and took to the fiord, and on October 3rd reached the capital of the Southern Inspectorate. This party undertook boat-work which would have dismayed seamen, although only one of their number was a sailor, and two out of the six had never been on the sea; and crossed a longer stretch of glacier than any one has accomplished before without, it would seem, having had previous experience of this nature. They wore red veils when on the ice (the worst colour they could have selected) without suffering ill-effects; and almost escaped frost-bite, though they seem to have experienced some of the lowest temperatures that have ever been recorded. One can only conclude that the six individuals forming the party were exceptionally hardy and fit men for the work they undertook.

The expedition, it is said, "owed its origin entirely to the Norwegian sport of *skiløbning*" (vol. i. p. 73). Every one of the party was an experienced *skiløber*, and all their prospects of success were based upon the superiority of *ski* in comparison with all other means of locomotion when large tracts of snow have to be traversed. "As much as eight or nine miles can be done within the hour" on ski, "while a speed of seven miles an hour can be maintained for a considerable length of time" (vol. i. p. 78). *Skiløbers* can come down steep hill-sides with gradients of 30° to 40° , and in such places can make jumps 60, 70, or even 90 feet long! (vol. i. p. 103), and come down 30 to 40 feet at a time! (p. 105). Thirty-one miles over hilly ground of a very variable character, and including all kind of difficulties are said (p. 109) to have been covered in 4 hrs. 26 min., and 136½ English miles in 21 hrs. 22 min., rests included (p. 110). After his journey was over, Dr. Nansen said, "Lest any reader should be led to believe, by what I have said here about the state of the snow and the difficulties we met with, that our ski were of little or no use to us, I ought perhaps to state once and for all that they were an absolute necessity, that without their help we should have advanced very little way, and even then died miserably, or have been compelled to return."

This is not quite clear to the non-*skiløbistic* mind, for it appears that the best two days' travelling over the snow-clad interior (September 18th and 19th) was done by sailing, and ski were not used at all. The distance covered in these two days was about 52 miles. Deducting these, it will be found that the average rate for all the rest of the time (in the interior) was less than seven

miles per day. On very few occasions they went more than 10 miles in a day. During a large part of the time neither ski nor any snow shoes were used, and when they were employed it was over "snow in a good state." If, then, they can be dispensed with when the snow is fit for sailing, and must be discarded when glacier is steep or broken, and are only of service when snow is in good order, it would appear that they can be dispensed with altogether, and this conclusion is supported by the fact that others have traversed long stretches of the snowy interior of Greenland without finding them necessary.*

While his tent was a dead failure and of a pattern that he himself condemns, in his sledges Dr. Nansen achieved an unqualified success. They weighed about 28 lbs. apiece, which is considerably less than the lightest forms that have been used upon English Arctic expeditions, and less than the lightest dog-sledges employed in Greenland. Nansen's sledges have received commendation from several of the most distinguished Arctic explorers, and from having survived the journey without injury were evidently well-adapted to their work. "No nails or pegs were used, but all the joints were lashed, and the sledges were thus more elastic under shocks and strains, which would have often caused nails to start. As a matter of fact, nothing whatever was broken the whole journey through." (Vol. i. p. 35.)

It is unnecessary to enter here into the perils and hazards of this journey. They were many and continuous. They were met only to be overcome—though until the last it is doubtful whether the bold Norwegian will sink or swim. The narrative proper is straightforward and vivacious. The book is eminently readable, and readers will rise from these volumes convinced that, though something was due to fortune, the success of this expedition at every stage was more due to Dr. Nansen. His fitness for a journey of this kind is shown in many ways, not the least being his ability to eat anything, down to puddings made from seals' blood, or raw ptarmigan and raw pony. His two Lapps do not seem to have been over-fastidious. They could eat raw ptarmigan, but drew the line at uncooked pony. Nansen grew quite indignant at their obstinacy. "They would have called us heathens," he says, "for, as they explained one day afterwards, it was only heathen and beasts of the field that ate meat raw. But at the time they said nothing, and maintained an attitude of dumb despair at the fate which had thrown them into the society of savages. . . . I really believe they would both have died of starvation rather than eat raw horseflesh." Astonished at their perversity, he exclaims, "How common it is to see things in this life turned completely upside down by prejudice!"

Dr. Nansen has very pronounced opinions in regard to the right food for expeditions in cold regions. He is a great believer in fat, and carried jam; but he is very strongly against rum, and his experience, he says, leads him to take a decided stand against the use of stimulants and narcotics of all kinds, from tea † and coffee on the one hand, to tobacco and alcoholic drinks on the other.‡ Four of the six were smokers, and these unhappy men were allowed during the crossing only *one* pipe on "Sundays and other specially solemn occasions." Eight pounds of sugar were taken for six men for sixty days, and were actually made to serve for two months and a half!

The results to be obtained from traversing a country completely buried

* The non-skilöber will also notice that experienced skilöbers, when on their ski, sometimes tumble heels over head in a very prosaic manner (vol. ii. pp. 372-6), and break through snow bridges six or eight feet wide (see illustration, p. 116, vol. ii.). This engraving may be profitably compared with another at p. 435, vol. i.

† It is to be remarked, however, that it is said that "it was a pleasure almost divine to get half a dozen cups of good hot tea with condensed milk," vol. ii. p. 6; and again, at p. 10, "we found unspeakable consolation in hot tea."

‡ To guard against surreptitious use of his alcohol for cooking, Dr. Nansen mixed methylated spirit with it. If he supposes that such a mixture is undrinkable, he is quite mistaken. Tastes differ. Some men like raw pony and others prefer raw spirit. Methylated spirit is much appreciated by the Eskimo on the West Coast of Greenland, especially when it is flavoured with cayenne pepper.

under snow and ice were not likely to be considerable. "One day began and ended like another, and all were characterised by nothing but a wearisome, wearying uniformity, which no one who has not experienced the like will readily realise" (vol. ii. p. 48). There were two matters, however, upon which it was within the power of this expedition to bring information sufficiently exact to be termed scientific, namely, the elevation of the interior, and the temperature which was experienced there. In regard to both of these points more information is desirable.

It is not at all clear how the altitudes that are quoted throughout the volumes have been deduced, and there are material contradictions respecting them in the narrative. At p. 185, vol. ii., in writing to Herr Gamel, Nansen says, "For several weeks we were more than 9000 feet above the sea"; but at p. 464 it is stated that the highest point reached was 8970 feet. From the section given at the end of vol. ii. it appears that the two weeks which were passed at the highest levels were those embraced between Sept. 1-15; and at p. 48, vol. ii., it is said that the height which had been attained on Sept. 1 was about 7930 feet by aneroid. This is about the altitude assigned to Sept. 1 upon the above-mentioned section. It seems that aneroid observations have been relied upon* for the determination of atmospheric pressure at the upper stations, and also at the highest ones; for at p. 48, vol. ii., it is said, "the height to which we had now mounted (Sept. 1) had brought us to the end of the millimètre scale of our aneroid barometers. They marked a pressure of 550 mm. (= 21.654 Eng. inches), and if we were to ascend still higher it would be difficult to continue our observations. By the help of the movable scale, however, we managed fairly well." From this it appears that the highest altitudes have been deduced from observations of aneroid barometers, which were taken beyond their range. The errors which are likely to be fallen into by using aneroids that have got beyond the range of their graduation are important;† and as many of Dr. Nansen's remarks and conclusions depend upon the correct determination of his altitudes, it is desirable that no doubts should exist as to their accuracy.

The same may be said in respect to the very low temperatures that he quotes. In two instances (September 12 and 14) he speaks of -49° Fahr., and he says that the "mean" temperature of certain days (September 11-16) varied from -22° to -29° Fahr. Incredulity has been expressed at these low temperatures, as the degree of cold is greatly lower than what might be expected. Though this is not sufficient ground for rejecting them, one may reasonably inquire what steps have been taken to verify the thermometers, and for more information as to the manner in which the temperatures were estimated.‡ The mercury carried by the party does not seem to have been frozen, and, if it were not, this would be evidence that a temperature as low as -38° or -40° was not attained.

* On p. 67, vol. i., it is said that "a hypsometer or boiling-point barometer, with the necessary thermometers were taken, and that this was found to be a particularly convenient form of barometer," but no boiling-point observations are quoted.

† Aneroid barometers are commonly graduated to the maximum of their capacity, and sometimes even beyond their capacity. It is not unusual to find the lowest inch (or inches) very largely in error. In working out the observations for altitude, the height of the barometer at the level of the sea has no doubt been assumed, but no information is afforded upon this point. The mean height of the barometer at Godthaab (corrected for gravity) is stated in the 'Smithsonian Tables, Meteorological and Physical,' to be 29.651 English inches.

‡ "The scale of our sling thermometers only read as low as -22° Fahr., as no one had expected such cold at this time of year in the interior of Greenland. But after September 8 the mercury quickly retired below the scale as soon as the sun disappeared in the evening. The lowest temperature we experienced could not, therefore, unfortunately, be determined with accuracy; but when I went to bed on the night of September 11, I put a minimum thermometer under my pillow. In the morning the spirit was a good way below the scale, which marked -35° Fahr. The temperature was no doubt below -40° Fahr., and this was in the tent, in which six men were sleeping and in which we had cooked our food with the spirit lamp."—Vol. ii. pp. 58-9.

Dr. Nansen's opinions about icebergs (vol. i. p. 419), and the excavating power of glaciers are not likely to receive general assent. He revives the exploded notion that glaciers have *excavated* valleys and fiords (vol. ii. p. 139, &c., &c.) This idea has been defunct for some time, and to refute his arguments would be but to slay the slain. It is true that there are localities in Greenland where glacier action has been carried to a much more advanced stage than in Europe, and to such an extent that the inequalities of rocky floors are levelled, and all irregularities completely obliterated. This has been done by abrasion and polishing, not by excavation, properly speaking. If the whole of a single valley could be found presenting this character it would be hard to deny that a considerable amount of hollowing had taken place. But no such valley has yet been discovered. The places where the rocky floors are levelled are exceptional; the rule throughout Greenland is that the glacier-ground rocks are of the type called *moutonnée*, having what are termed *lee-sides*, and the existence of these lee-sides is evidence that no considerable amount of hollowing has occurred.*

But these things notwithstanding, the great fact remains that Dr. Nansen has crossed Greenland, has brought his party through a hazardous journey without a scratch, and has proved himself equal to every emergency. He has shown consummate ability in dealing with ice and snow, and it is to be hoped that his extraordinary energy will soon be occupied in some congenial field, offering greater opportunities for the advancement of geographical knowledge than the icy mountains of Greenland. His work is well-produced, admirably translated, and its illustrations are numerous, appropriate, and unusually good. Its bulk, however, is much too great. The two volumes are nearly four inches thick, and this is too large a demand upon the space either of private or public libraries. Without omitting any part of the narrative, or any of its illustrations, it might have been easily compressed within half its present size.—
[Edward Whymper.]

GENERAL.

Barttelot, Walter George.—The Life of Edmund Musgrave Barttelot, Captain and Brevet-Major Royal Fusiliers, Commander of the Rear Column of the Emin Pasha Relief Expedition; being an account of his services for the relief of Kandahar, of Gordon, and of Emin. From his letters and diaries. London, Bentley, 1890: 8vo., pp. xi. and 413. Price 16s.

Like Mr. Troup's volume, this collection of Major Barttelot's journals and letters is an important contribution to the history of the Emin Pasha Expedition; but it is impossible in these pages to enter into the unhappy subjects of controversy that have arisen in connection with that expedition.

[**Huxley, T. H.**].—The Aryan Question and Pre-historic Man. [From the 'Nineteenth Century,' Nov. 1890.] 8vo.

International Geodetic Association.—Verhandlungen der vom 3. bis 12. October 1889 in Paris abgehaltenen Neunten Allgemeinen Conferenz der Internationalen Erdmessung und deren Permanenten Commission redigirt vom ständigen Secretär A. Hirsch. Zugleich mit den Special-Berichten über die Fortschritte der Erdmessung und den Berichte der Vertreter der einzelnen Staaten über die Arbeiten in ihren Ländern herausgegeben von der Permanenten Commission der Internationalen Erdmessung.—Comptes rendus des séances de la Neuvième Conférence Générale de l'Association Géodésique Internationale et de sa Commission Permanente réunies à Paris du 3 au 12 Octobre 1889, &c. &c. Berlin, G. Reimer. 1890: 4to., maps.

* See 'Scrambles amongst the Alps,' pp. 141-9, 311-44.

Johnston, Keith.—The London Geographical Series. A Physical, Historical, Political, and Descriptive Geography. Fourth edition. London, E. Stanford, 1890: 8vo., pp. xi. and 490, maps and illustrations. Price 12s. [Presented by the Publisher.]

The present edition has been revised and brought up to date by Mr. E. G. Ravenstein.

Keltie, J. Scott.—Applied Geography. A preliminary sketch. London, G. Philip and Son, 1890: cr. 8vo., pp. 169. Price 3s. 6d. [Presented by the Publishers.]

The object of this little work is, as stated in the preface, "to show what, in my estimation, are some of the bearings of geographical knowledge on human interests; on the course of history, but more especially on industry, commerce, and colonisation. The first two chapters deal with general data and methods, which are illustrated in the following chapters with special reference to Africa, the British Empire, and some of the chief commodities of commerce. The book is really a series of suggestions and examples." A series of eleven maps and diagrams, specially prepared by Mr. E. G. Ravenstein, illustrate the volume and include—a map of the world, showing commercial highways; maps of Africa showing—height of land, vegetation, density of population, river basins and ocean currents, annual rainfall, and the partition of Africa; diagrams illustrating the commerce of the British Empire compared with that of foreign countries, and the cultivated, occupied, and waste areas of Australia, British South Africa, and Canada; and maps of the world showing distribution of vegetation, &c., and distribution of minerals.

NEW MAPS.

(By J. COLES, *Map Curator, R.G.S.*)

EUROPE.

Deutschen Reiches.—Karte des —. Scale 1:100,000 or 1·3 geographical miles to an inch. Herausgegeben von der Kartogr. Abtheilung der Königl. Preuss. Landes-Aufnahme 1890. Sheets:—187, Stettin; 419, Bautzin; 446, Hirschfelde; 503, Prüm. Price 1s. 6d. each. (*Dulau.*)

Italia.—Carta d' —. Scale 1:100,000 or 1·3 geographical miles to an inch. Sheet No. 106, Firenze. Istituto Geografico Militare, Firenze, 1889. Price 1s. 6d. (*Dulau.*)

Tromsø Amt (Norway).—Ethnografisk Kart over —, samt Ofotens Præstegjæld af Nordlands Amt. No. 1, Præstegjældene: I. Lenvik, II. Berg og Torsken, III. Trarø, IV. Bjarkø, V. Ofoten, samt dele af VI. Karlsø, VII. Tromsøundet, VIII. Balsfjord, IX. Maalselven, X. Ibbestad, XI. Trondenes, XII. Kvædfjord, af J. A. Friis, Professor ved Universitetet i Christiania. Scale 1:200,000 or 2·7 geographical miles to an inch. Udgivet paa Offentlig Bekostning, 1890. 3 sheets. — Ethnografisk Kart over Tromsø Amt. No. 2. Præstegjældene: I. Skjærvø, II. Lyngen, III. Balsfjord, samt dele af IV. Karlsø, V. Tromsøundet, VI. Maalselven, af J. A. Friis, Professor ved Universitetet i Christiania. Scale 1:200,000 or 2·7 geographical miles to an inch. Udgivet paa Offentlig Bekostning, 1890. 3 sheets. (*Dulau.*)

This is a very complete ethnographical map of the Tromsø Amt, on which the families to which the inhabitants belong are indicated by a well-chosen

system of symbols. Information is also given as to the materials used in the construction of the dwellings in which the people live, their knowledge of the Norwegian language, and the number of families of the same nationality inhabiting each house. In addition to this the topographical features of the country are indicated by contour lines, and there is a very full explanation of the symbols used, and the words of the Lapp language which frequently occur on the map. All means of communication are laid down, the roads which can be travelled in carriages being distinguished from those which are not available for that purpose; and among other items of information that would be serviceable to travellers in case of accident or sickness, is the manner in which the residences of medical men are indicated. The rivers which salmon ascend, and the places where their further progress is arrested by rapids, are shown. The station in fjords where the summer and winter fisheries are carried on are laid down, and the species of fish to be caught in each locality are shown. Any person desiring to gain general information with regard to this portion of Norway would do well to consult this excellent map.

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ASIA.

Indo-Chine.—Carte Politique de l'—. Par Mr. François Deloncle, Député. D'après les Cartes du Service géographique de l'Armée en Indo-Chine, les documents officiels Annamites, Birmans, Siamois et Chinois, et les travaux, explorations, voyages et missions les plus récents, Octobre 1889. Scale 1:1,800,000 or 24·5 geographical miles to an inch. 2 sheets. (Dulau.)

This is an outline map on which the areas and boundaries of the native States, as well as the possessions and protectorates of foreign powers, are shown. Main roads and trade routes between places of importance are laid down.

— Carte Politique de l'—. Par Mr. François Deloncle, Député. Scale 1:3,700,000 or 50·6 geographical miles to an inch. Paris. (Dulau.)

This is a reduction of the larger scale map of the same district.

Tonkin.—Carte Provisoire du ——. Dressée à l'État-Major de la Division d'Occupation sous la direction de Mr. le Commandant Berthaut, d'après les levés réguliers, les reconnaissances et les documents divers fournis par les officiers de l'armée de terre et ceux de la marine. Publiée par le Service géographique de l'Armée. Mars 1890. Scale 1:500,000 or 6·8 geographical miles to an inch. 4 sheets. (Dulau.)

This is a very effective map of Tonkin, in the construction of which all the latest reliable material appears to have been used. The hills are shaded

with brown chalk, all the principal routes are indicated by red lines, while those less known are shown in black. A table is given containing an explanation of the symbols employed to distinguish the importance of the towns, and the meaning of the native terms which appear on the map.

AFRICA AND MADAGASCAR.

Algérie.—Carte topographique de l' —. Scale 1:50,000 or 1·4 inches to a geographical mile. Dressé, gravé et publié par le Service géographique de l'Armée. Paris. Sheets: 23, Tizi-Ouzou; 32, Jemmapes; 43, Palestro; 44, Dra el Mizane; 45, Fort National; 66, Bouïra; 67, Tazmalt; 103, Bosquet; 129, Sidi bel Acel; 130, Inkermann; 156, Relizane; 180, Lourmel; 208, Beni-Saf. Price 1s. each sheet. (*Dulau.*)

Bénin, Golfe de.—Carte des Établissements Français du —. Par Victor Ballot, Administrateur Principal des Colonies, Résident de France au Bénin, 1889. Scale 1:400,000 or 5·5 geographical miles to an inch. J. P. Trouillet, Editeur, Paris. (*Dulau.*)

This is a rough sketch survey, on which the trade routes, native towns, and river systems are laid down with approximate accuracy, and being drawn on a fairly large scale, will doubtless be useful to any traveller visiting the country.

Congo Français.—Colonie du Gabon et du —. Reconnaissances préliminaires pour l'Étude des voies de Communications entre la Côte du Loango et Brazzaville par la Vallée du Kouillou-Niari. Carte levée par Léon Jacob, Ingénieur, chargé de Mission. 1887-1888. Scale 1:185,200 or 2·5 geographical miles to an inch. 3 sheets. J. P. Trouillet, Editeur, Paris. (*Dulau.*)

The western sheet of this map includes the country on the left bank of the Kuilloo river, between latitude 3° 40' S. and 4° 40' S., and extends in longitude to 13° 10' E. of Greenwich. In some parts the topography is indicated with considerable minuteness, in others the country within a short distance of the routes followed alone is shown, but throughout the map elevations along the routes are given in metres at short intervals. On the central sheet the routes are continued, one passing through the Bayakas and Balali countries, and the other to the south, not far from the Niadi river. Little more than the country within a short distance of each of these routes is shown, except in the neighbourhood of Buena, where three different routes are laid down. The country shown on the eastern sheet has been traversed in many directions, and consequently contains much more topographical detail. The map as a whole is an excellent specimen of a preliminary and route survey.

Dahomey.—Mission au — (21 Novembre-28 Décembre 1889). Itinéraire suivi par M. Bayol, Lieutenant-Gouverneur des Rivières du Sud de Kotonou à Abomey. Croquis établi par M. Angot, Membre de la Mission, Secrétaire du Lieutenant-Gouverneur. Scale 1:200,000 or 2·7 geographical miles to an inch. Service Géographique des Colonies. (*Dulau.*)

Madagascar.—Carte des Établissements Français de Diego-Suarez, Nossi-Bé et Dépendances, publiée avec les encouragements de Monsieur le Sous-Secrétaire d'État des Colonies, par Alfred Durand. 1890. Comptoir des Intérêts Coloniaux, Editeur. (*Dulau.*)

Soudan Français.—État-Major du —, Campagnes 1886-87, 1887-88, Mr. Gallieni, Lieut.-Colonel d'Infie. de Marine, étant Commandant Supérieur. Carte dressée par MM. Fortin (Capitaine d'Artie. de Marine) et Estrabou (Administrateur Colonial). Scale 1:500,000 or 6·8 geographical miles to an inch. Gravé par Erhard Fres., Paris. Sheets:—Bafoulabé, Benty, Bissao, Boké, Djenné,

Falaba, Géba, Goumbou, Hamdallahi, Kayes, Kita, Koumin, Matam, Nioro, Saldé, Sedhiou, Ségou, Siguiri, Timbo, Timbouktou. (*Dulaud*.)

This map is an important addition to the Map Room collection. It is drawn on four times the scale of the large map of Africa published by the French War Department. The twenty sheets already supplied contain an amount of information with regard to the French Soudan, that is not to be found on any other published map. Although the index has not as yet been presented to the Society, it is evident that several sheets have to be published to complete this map. The hill-shading is effective, the rivers are coloured blue, and the routes, which are indicated by a red line, show up clearly, and are very easily followed.

AMERICA.

British Honduras.—Map of —, by Alfred Usher, F.S.I., F.R.G.S., &c. Compiled from Surveys by J. H. Faber, E. L. Rhys, E. P. Usher, R. Hume, and others. The coast-line from the Admiralty Charts. Scale 1:385,000 or 5·3 geographical miles to an inch. Revised Edition, 1891. F. S. Weller, Lithographer, London.

This map has been carefully compiled by Mr. Usher from his own observations, and the most recent and reliable data. It shows all land grants and the proposed lines of railways, in addition to which some useful notes, with regard to the depth of the rivers, revenue and expenditure, meteorological observations, &c., are given.

Central America.—Map showing approximately the route of the Projected Railway according to advertisement calling for tenders for construction from Belize to unite with the railroad from the City of Guatemala to the Pacific Ocean. Compiled from original surveys and collated from the most authentic sources by Alfred Usher, F.S.I., F.R.G.S., &c. Scale 1:2,350,000 or 32·1 geographical miles to an inch. F. S. Weller, lith., London.

ATLASES.

Bartholomew, J. G. [F.R.S.E., F.R.G.S., &c.]—Physical and Political School Atlas. A series of eighty maps with general Index. By J. G. Bartholomew, F.R.S.E., F.R.G.S., &c. London, Macmillan & Co., 1891. Price 7s. 6d.

In addition to a diagram illustrating the vertical distribution of climate, an excellent sheet of the projections most frequently used in the construction of maps, and one on which the solar system, the seasons, eclipses, phases of the moon, ocean tides, &c., are shown, there are sixty sheets of physical and political maps. At the commencement, a useful list is given of the root and meaning of some foreign words which frequently enter into the composition of geographical names as prefixes and affixes, while on another page there is an alphabetical list of countries, and the numbers of the maps on which they may be found.

The maps are all very nicely drawn, and well suited to the purpose for which they have been published. Among others, the large map of the world on Mercator's projection is worthy of special commendation, as are also the maps of Africa, which have been carefully brought up to date. The atlas is furnished with a copious index in which the approximate position of each place in latitude and longitude, and the number of the map where it may be found are given. Considering the amount of good work which this atlas contains, the price asked for it is very reasonable.

Berghaus' Physikalischer Atlas.—(Begründet 1836 von Heinrich Berghaus). 75 Karten in sieben Abteilungen, enthaltend mehrere hundert Darstellungen über Geologie, Hydrographie, Meteorologie, Erdmagnetismus, Pflanzenverbreitung, Tierverbreitung und Völkerkunde. Vollständig neu bearbeitet und unter Mitwirkung von Dr. Oscar Drude, Dr. Georg Gerland, Dr. Julius Hann, Dr. G. Hartlaub, Dr. W. Marshall, Dr. Georg Neumayer, Dr. Karl v. Zittel. Herausgegeben von Prof. Dr. Hermann Berghaus. Zweiundzwanzigste Lieferung.

Inhalt: Nr. 17, Fließende Gewässer. Nr. 64, Verbreitung von Krankheiten. Nr. 65, Bekleidung. Gotha, Justus Perthes, 1890. Price 3s. each part. (*Dulau.*)

Sheet 17 contains thirty plans, illustrative of rivers, streams, falls, rapids, and subterranean rivers. The distribution of diseases over the earth's surface is shown on sheet 64 by two principal maps on the elliptical projection, one of which indicates the extent and range of endemic diseases of the nineteenth century, and the other the epidemic for the same period. In addition to these, a small map of Central Europe, geologically coloured, is given, on which the special localities where diseases of the throat are most prevalent are marked, thus showing the connection between certain geological formations and types of throat disease. The clothing, food, dwellings, and occupations of the peoples of the world are given in four maps on sheet 65; one map, by the system of colouring, indicates the material used in the construction of clothing, where any is worn, another is devoted to food and occupations, while the remaining two deal with dwellings. Like all the other maps of this atlas, these are beautiful specimens of cartography, and contain a vast amount of information on the subjects they deal with.

PHOTOGRAPHS.

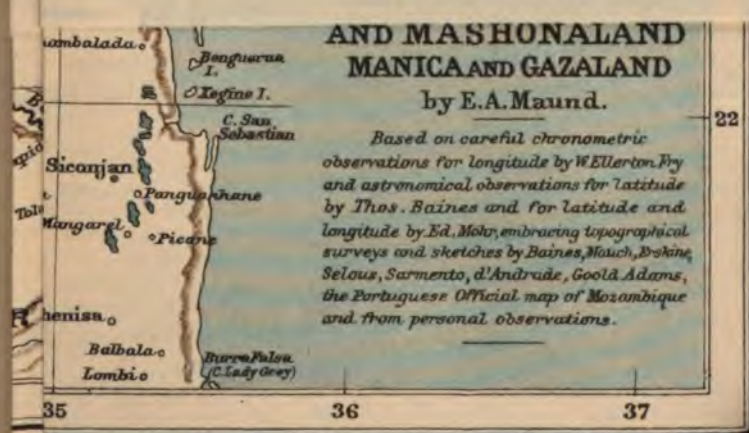
British Honduras and Guatemala.—Twelve Photographs of —, taken by Mr. Alfred Usher, F.S.I., F.R.G.S., &c., 1890.—1. Garbutt Fall (frontier line), Old River, British Honduras.—2. Village of Monkey-River Bar (south side), British Honduras.—3. Requena's Bank from Cayo (eastern branch, Old River). Pitpan and crew.—4. Victoria Fall, and houses at Benque Viejo from above, 275 feet above sea-level. Ferry, Benque Viejo, British Honduras.—5. Residence of H.B.M. Consul, Livingston, Guatemala.—6. Main Street, Cayo (eastern branch, Old River). British Honduras.—7. Steamboat Pier, Livingston, Guatemala.—8. Plaza Victoria, Church, Court House, and Novelo's Store, Benque Viejo, British Honduras.—9. Post Office on hill, Livingston, Guatemala.—10. Requena's Bank from Cayo (eastern branch, Old River). Pitpan and crew. British Honduras.—11. Road to Pier, Livingston, Guatemala.—12. "Bethel," Wesley Missionary, Tole'o, British Honduras. (Presented by Alfred Usher, Esq., F.S.I., F.R.G.S., &c.)

There are a very nicely taken set of photographs illustrating the scenery and dwellings of the country people in British Honduras. There are also some views taken at Livingston, Guatemala. These views are all the more creditable from the fact that they were developed by Mr. Usher under somewhat adverse circumstances during his travels.

Eastern Archipelago.—Seven Photographs of various Islands in the —, taken by Captain J. F. L. P. Maclear, R.N.—1. Dobbo, Arru Islands.—2. Malays, Natives and Arabs, Dobbo, Arru Islands.—3. Prau hauled up on the beach for the season, Dobbo, Arru Islands.—4. Main Street, Cuyo. Alcade's house and oficina, Philippine Islands.—5. Amboina, looking across from Landing Station.—6. Native Houses at Likupang, Minehassa, North Celebes.—7. Krakatoa, from the southward, 1886. (Presented by Captain J. F. L. P. Maclear, R.N.)

These form an interesting series of photographs taken in the Eastern Archipelago.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.



AND MASHONALAND MANICA AND GAZALAND

by E.A. Maund.

Based on careful chronometric observations for longitude by WELLERTON FRY and astronomical observations for latitude by THOS. BAINES and for latitude and longitude by Ed. Mohr, embracing topographical surveys and sketches by Baines, Mauch, Boskine, Selous, Sarmento, d'Andrade, Gould Adams, the Portuguese Official map of Mozambique and from personal observations.

Stanford

VEGETATION



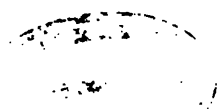
CLIMATE OF HUMANITY



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Scale of 100 Miles to the Sq. Mile.
(10 to 100 miles)

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PROCEEDINGS
OF THE
ROYAL GEOGRAPHICAL SOCIETY
AND MONTHLY RECORD OF GEOGRAPHY.

Explorations in Alaska and North-west British Columbia.

By H. W. SETON-KARR.

(Read at the Evening Meeting, December 8th, 1890.)

Map, p. 136.

SINCE I had the honour of addressing this Society on our explorations of the Saint Elias glaciers in 1886, I have visited many countries enjoying more genial climates, but returned with renewed zest and freshness this summer to Alaska, with the aim of exploring an unknown portion of this sub-Arctic region and a new pass across the mountains of British Columbia, adjacent to the scene of my previous adventures with the *New York Times* expedition of that year.

Mount St. Elias stands isolated, but behind it I saw a galaxy of snow-peaks, a sea of glittering glaciers, a collection of huge pinnacles clothed from head to foot in ice and snow, amongst which I think it doubtful if anyone will ever penetrate for any long distance, owing to the difficulties of transport. In 1888 four members of the English Alpine Club—Messrs. E. H. and H. W. Topham, G. Broke, and W. Williams—ascended to a height of 11,000 feet on the south side of St. Elias, but failed to reach the summit.

I wished this year to ascertain how far this Canadian Switzerland extended inland, and whether there was a land route to Yakutat Bay, as the Indians had told us there was.

How far inland these ranges and glaciers extend yet remains to be discovered, and I will mention later on some reasons why the country in rear of these ranges should prove to be exceptionally remarkable.

This entirely unknown country measures about 400 miles in length and 200 miles in breadth, and the larger part is situated in British territory. I penetrated but a comparatively short distance into its outer rim, the difficulty, besides the natural obstacles met with, being the extortionate demands of the Indians—and their services are indispensable as pack-carriers.

Throughout this expedition we bore the British ensign, a habit which I recommend to explorers. Besides its moral effect, both upon our-

selves and upon the natives, its bright colours are cheerful in gloomy forests, or on the snow.

The luxurious and pleasurable manner in which this expedition was commenced by a trip north-westwards of nearly a thousand miles amidst an archipelago of islands, served only to throw into sharp relief the hard work and painful methods of travel necessary in order to overcome the obstacles to our advance presented by such a difficult and almost impenetrable country—the rapidity of the ice-cold rivers, the steepness of the damp mountains, the denseness of the forest and brush, and the necessity of looking to the Indians for help—help which is never withheld so long as dollars are forthcoming. So long as there are Indians, travel in these difficult regions of North-western America will be a mere question of money, for with plenty of Indians travel there is easy.

Let me endeavour, in a few condensed sentences, to give you a clear idea of the outward appearance of this portion of the Pacific coast—the Pacific seaboard of the Canadian Dominion. Its geographical characteristics are very marked. Commencing from the south, California, Oregon, and Washington present a plain coast-line to the ocean, with scarcely any good sheltered harbour. This is the case as far north as Cape Flattery, or the Straits of Juan de Fuca, where British territory commences. This is the beginning of that remarkable network of fringing islands which has its counterpart on the coast of Norway and the west coast of South America.

This Inland Passage, as I shall call it, continues northwards past British territory (the Canadian province of British Columbia), and includes the southern arm of Alaska, which is here a narrow strip of coast sheltered by the seaward islands.

At Cape Spencer, the southern projection seawards of the St. Elias Alps, the Inland Passage suddenly comes to an end, and the coast becomes more stern and shelterless than ever; there is only one harbour for vessels, and only about six places where small boats can land.

So much for the general shape and character of the coast-line between the thirtieth and sixtieth parallels of latitude.

The differences of climate in different places are very great, and admit of broad distinctions as regards the mainland of British Columbia. A dry climate, where water is precious and irrigation necessary to agriculture, exists on the landward, eastward, or leeward side of the first main range of mountains—the Cascades; and in a less marked degree this dry zone also exists in a strip on the leeward side of the main range of the Rocky Mountains and on the leeward side of all the ranges. But on the islands, and along a narrow belt of the mainland facing them, there is too much water; the winters are mild and rainy, and more rain than seems necessary falls in summer.

Consequently, vegetation on the coast is very dense: the fir and

cedar reach to a great size, the growth of ferns, plants, and bushes is rich and luxuriant, interspersed with thickets of salal (*Gaultheria shallon*). Inland, on the dry strip, on the contrary, vegetation is thin, the trees are small; and the presence of cacti remind one, at every step, that waterproof and umbrella might as well be left at home.

As regards Puget Sound and Victoria, the rainfall is somewhat lessened by the Olympic range of mountains, which stretches seaward and ends in Cape Flattery, which I before alluded to, so that the summers are dry and the climate delightful compared to other places on the coast.

For many years to come the timber will be a mine of wealth. In all parts of the Columbian coast, especially in the southern parts nearer the centres of population, are found little lumbering camps, which shift their position frequently, as the larger trees fall under the axe, chiefly for the foreign market.

The agricultural resources of this colony have not yet been greatly developed, owing to the necessity of irrigation in the dry zones and owing to the thickness of the forests in the damp zones, and on account of the difficulties of marketing the products. The land laws are wise and liberal, however, in British Columbia.

I must next touch briefly on mining. The rich ledges which are being profitably worked in California, Oregon, and Washington must have their counterparts in British Columbia and Alaska.

As I went northwards along the coast we touched at the coal-mines on Vancouver Island; the deepest shaft here at present is one of 626 feet, but it has been shown by boring that good coal is found at a much greater depth. In fact the supplies are probably almost inexhaustible, both on Vancouver Island and on other islands near. On another occasion, when canoeing to Bute Inlet, I visited the newly-found iron-mines on Texada Island.

During the next twenty years we shall see great mining operations begun in British Columbia. There has been a great rush of settlers and land speculators lately to Quatsino Arm, an inlet on the seaward side of Vancouver Island, because, besides the presence of coal, there is the probability that this harbour may become the starting-point of the trans-Pacific steamers. Then again, when I reached Fort Wrangell I found two separate companies about to commence hydraulic mining for gold along the diluvial banks and terraces of the Stikine river—being the first enterprise of the kind undertaken. The river was still frozen over. It generally "opens" the first week in April. Then again, further up the coast on Douglas Island, I visited the celebrated Treadwell gold-mines and reduction works, containing, I understand, 240 stamps, and outputting between one and two hundred thousand dollars' worth of gold per month. With regard to mining, I have said enough to merely indicate its extent.

Lastly, I must allude to the fisheries. At present the salmon fisheries are by far the most developed; the deep-sea fisheries are yet unexplored, and can hardly be said to have taken their place amongst the industries of the country.

All the larger streams of the coast and islands swarm with varieties of *salmonidæ* from spring till late autumn. There are about four kinds, but their habits are yet entirely unknown. We only know when to expect them in the rivers and estuaries, and to make preparation accordingly for their capture.

The Fraser and Skeena rivers in British territory, and the Columbia in American territory, are the scenes of the greatest activity; and on each one the amount of salmon canned each summer reaches to hundreds of thousands of cases, each containing four dozen tins, beside quantities salted and also cured by drying, the latter principally by the Indians for their own use—for dried salmon is the chief food of the coast tribes.

Most of the canneries on salt water net their salmon near the mouths of different rivers, using small steamers and whale-boats for the purpose. On the Fraser and Columbia the fish are netted in the river itself as well as at the estuary; and I might mention that this summer on the Fraser the salmon did not at first make their appearance as usual, and fears were entertained of serious losses to the fishermen and cannery owners; then suddenly the salmon appeared in countless myriads; more fish were netted than could possibly be used, and the great river boiled with fish-life. I remember three months ago, towards the end of the season, as high up the river as Lillooet, seeing the surface literally black with their dorsal fins, feeling them glide through my fingers, and even capturing some salmon with my umbrella.

From the manager of a cannery at Port Essington, near the Skeena river, I obtained the following particulars. I also visited other canneries at Pyramid Harbour, at Alert Bay, and on the Fraser river. The fish are cleaned and cut up to fit the cans, in which they are soldered down. These are then boiled in fresh water, pricked, soldered again, and finally steamed in a retort.

Having alluded to the salmon, I am bound to mention the halibut and cod, and the black cod, which is not known in Atlantic waters. The experimental efforts during the last three years have shown that these fisheries may turn out superior to the Newfoundland banks; besides which the storms are less severe, there are no icebergs, and the ports for shipping are near at hand.

There are many other kinds of fish. Dog-fish are boiled down to make a cheap kind of oil, by most of the settlers along the coast, as a lubricant, or for burning. The oolachan, or candle-fish, furnishes oil to the natives for food purposes, the herrings come in shoals at certain times, and I have seen numbers of whales in these solitary inlets of the Pacific.

The number of islands and rocks make the Inland Passage difficult of navigation. I met a man trading on the Skeena river who had turned up a wrong inlet or passage near Banks Island, and sailed northwards for three days, till he reached the head of this arm of the sea, before discovering his error, and was obliged to sail back some hundreds of miles. I asked him whether the Indians were dying off. He answered, "Yes, nicely."

Then again the tides are most complicated. In some inlets there is but one tide a day for some months in the year, sometimes no tide, and sometimes three. In other inlets the tides seem to follow no rule at all; the whirls and rips are most dangerous in certain places to small boats, while the velocity reaches 12 knots an hour in narrow parts. Is it any wonder that the Canadians have given up any attempt at a tide-table in despair?

Finally, to close these introductory remarks, I will endeavour to give an idea of the scenery and surroundings passed through as I travelled north by one of the periodical steamers which keep up the increasing communications between the new-world ports and newly-discovered harbours in Puget Sound and on Vancouver Island (such as Tacoma and Victoria) on the one hand, and the new settlements along the coast, the old Russian fortress of Sitka, and other points as far north as Chilcat on the other hand.

The distance from San Francisco and return is about four thousand miles, and the time occupied varies from twenty to thirty days, and from Puget Sound from twelve to twenty-two days.

Commencing at the south part of the Inland Passage, the first inlet is Puget Sound, nearly two hundred miles long, and 1600 miles in circumference, with numerous islands all thickly wooded.

On a cloudless day snow-mountains can be seen glittering in every direction—some on Vancouver Island, some on the mainland to the eastward, others in the Olympic Range.

In April I left Victoria for my fourth journey up the coast. A line of railway connects Victoria with the coalfields. Thence in the steamer I proceeded westward between Vancouver Island and the mainland, through the wide channel named Straits of Georgia. On the side towards the mainland are two deep inlets—Bute Inlet, which I traversed by canoe with Indians in 1887, which is about thirty miles long, and with mountains over eight thousand feet high, rising sheer from the water, and Jervis Inlet. These are not seen from the straits. It is necessary to penetrate the narrow passages between the groups of islands before they become visible. All the rocks I examined in Bute Inlet were granite. On Vancouver Island at this point the mountains towards the centre are heavily timbered, generally obscured by cloud, and over five thousand feet in altitude. Farther to the west there are peaks on the island which rise to over seven thousand feet.

The way now lies through Discovery Passage, passing Cape Mudge

(named from one of Vancouver's officers), skirting Valdes and Thurlow Islands, and threading Johnstone Straits, where a spur of the mainland thrusts itself out amidst the other islands, and comes into close proximity to Vancouver Island. Entering Queen Charlotte Sound, and passing close to an Indian village and a cannery, we strike away from Vancouver Island, along the northern shore of which we have been coasting for about two hundred and fifty miles. Between the mainland and the open sea in Queen Charlotte Sound there is nothing but the Sea Otter Islands, but the steamer soon enters more intricate and winding channels. At one point we turn off through the narrow Gunboat Passage—for the broad inviting channel ahead only leads inland—and follow an exceedingly long and narrow fiord between Princess Royal Island and the mainland, more like a river than an arm of the sea, scooped out no doubt partly by the action of glaciers, where is found some of the grandest scenery to be seen on this particular route—composed chiefly of waterfalls, cliffs, trees, and high mountains on the right hand and on the left. On emerging we immediately enter Grenville Channel, remarkable as being nearly forty nautical miles in length, in some places not more than a mile wide, yet almost perfectly straight, and shut in by high mountains like walls on either side.

We emerge through Arthur Pass and catch sight of the first sign of human life seen for many leagues (unless it has been some Indian canoe), in the shape of a salmon-cannery built on piles above low-water mark, this being the vicinity of the Skeena river. Twenty miles farther, in Chatham Sound, the old Duncan Mission of Metlakatla is seen, with a row of substantial houses, and fifteen miles farther the Hudson Bay Company's Fort Simpson. We soon cross the mouth of Portland Inlet, which leads to Naas river and the International boundary (which reaches the sea at the head of Portland Canal—a fiord penetrating the mainland for a distance of about 100 miles); this is the commencement of Alaska, here a mere narrow strip that shuts off the whole of North British Columbia from the sea.

If cousin Jonathan would make this narrow strip over to British Columbia, I think we might reasonably allow him in exchange the privilege of the exclusive rights of the seal-fisheries in Behring Sea. This would also save the expense of marking the frontier, which is not yet delimited. We might even throw in Mount Saint Elias, about which there was so much uncertainty as to its exact position, and whether it lay in American territory or no, that an expedition of United States Government Surveyors, Messrs. Kerr and Russell (whom I had the pleasure of meeting on my return at Sitka) was this summer sent to locate it precisely, being conveyed to Behring Bay, or Disenchantment Bay, in a man-of-war. They are of opinion that St. Elias is in the Union, but, as though to console us for the loss, it is found not to be so high as the United States Coast Survey made it out to be. I

must refer again to this expedition later on. Seventy miles farther, passing through Tongass Narrows, brings one to a settlement on Revil-lagidedo Island: as far again, through Clarence Straits, and then between Zarembo and Etolin Islands, brings one to the American settlement of Fort Wrangell.

There is practically no agriculture here, nor anywhere else in Alaska, nor do I think there ever will be. Its wealth lies in other things, which I have indicated in referring to British Columbia.

Here I found some small stern-wheel steamers used for the ascent of the Stikeen river, of which the mouth is distant about fifteen miles to the northward. It is navigable to Telegraph Creek, in British territory, a distance of 126 miles.

Above this is the "Great Cañon," which extends for many miles, quite impassable for boats, but traversed by the miners in winter on the ice. From Telegraph Creek a pack trail 62½ miles long, constructed by the Canadian Government, leads to the Cassiar mining district. There are some horses employed here as pack-animals. They can only go backwards and forwards from Telegraph Creek to Dease Lake, where the trail ends. In 1887 Dr. Dawson reached the Yukon by this route. He affirms the probability of a possible connection of the Stikeen and Mackenzie by a railway at some future date. The headwaters of the Stikeen are yet unknown, they are in British Columbia, in a country said to be very mountainous. There are a number of remarkable glaciers in the Stikeen valley, the four largest of which are on the west side, but in size they bear no comparison with those on the coast near Mount St. Elias. Near one known as Great Glacier, there is a copious hot spring. Another is known as Flood Glacier. Occasionally there comes a great rush of water from it, so large as to raise the river to half-flood level for a few hours.

A similar phenomenon caused us much perplexity on the Yahtsetah river near Mount St. Elias.

After leaving Fort Wrangell, we emerge into Sumner Strait, and turning abruptly to the right, steam cautiously through Wrangell Narrows which has been carefully buoyed for vessels.

Another hundred miles through a series of wide channels, keeping between Admiralty Island and the mainland, brings one to Juneau, a mining settlement, and the outfitting-place for miners bound for the interior districts of the Yukon. Here is the Treadwell mine, to which I alluded previously.

It is yet a day's journey northwards to Chilcat, where I commenced my explorations; but I must digress for a moment to allude to Sitka (Alaska's chief town), and Glacier Bay, where the steamer called in order to allow us to examine the ice-cliffs in close proximity, from which masses of ice fall constantly. Muir Glacier has a sea-front of a mile and ice-cliffs 300 feet high, with a central velocity of 70 feet a day. The

Jakobshavn Glacier in Greenland moves 54 feet daily, but the Mer de Glace only $1\frac{1}{2}$ feet a day. A large number of other glaciers, probably as big, or bigger, discharge their ice into this great bay, which is consequently almost choked by miniature bergs, through which the steamer forced her way. Of the encircling snow-peaks the highest is over fourteen thousand feet.

Sitka is situated on Baranoff Island, half a day's sail to the southwards, in a bay surrounded by high mountains and studded with beautiful islands, but very damp and rainy. The story of the capture of New Archangel, or Sitka, by the Russians from the Indians, is a series of bloody fights between Baranoff and his men and the natives. He came here in the year 1799, after hearing the report of Captain Shields, an Englishman in the Russian service, accompanied by a number of sea-otter hunters in their *bidarkies*, or seal-skin canoes. About six miles from the present Sitka he built a stockade. During the absence of Baranoff with most of the garrison, this stockade was destroyed by the Indians and the defenders killed, with the exception of some who escaped on board an English ship, which conveyed them to Kodiak. In 1804 Baranoff returned to Sitka with forty Russians and three hundred Aleut hunters. He found the natives in possession of a strong stockade, built on the site of the present log castle. In endeavouring to capture it, he was at first severely repulsed, but he finally, after a bombardment, dislodged the Indians, who were estimated at 5000. At the present day their numbers are less than a tenth of that. Upon the site of the Indian town, the Russians erected huge log buildings, some of which stand here to-day, to attest the solidity with which they were constructed.

The extreme healthiness of the country is an advantage, and I may mention that I know no healthier one; but this is more than counterbalanced in the case of the explorer, by its being the most difficult to penetrate of any within the temperate zones. In this I shall be borne out by those who have attempted it. Part of the region is included within the territory of Alaska, part in British Columbia, a colony which is but now emerging from the sway of savagery. Much of it till now has been barred to whites by the red-man. For instance it was only within recent years that the Taiya Pass to the Yukon was opened to miners, while this year the same tribe who had prevented the miners from passing, by their rapacious demands as packers, placed a serious obstacle in the way of travel. As to the Chilcat passes, the twin doorways to the interior, I was uncertain up to the very last moment whether the Chilcat tribe would permit me to go by. I therefore camped first on the seaward side of the straggling aggregation of houses (some forty in number) which forms the winter village, named Klokwan, and after two days shifted my camp to the landward side, nearer to the unknown regions, so that I might test the feeling of these Indians relative to a white man entering their country before I commenced the ascent.

Before I could engage any of them to accompany me they required to be convinced that I was no trader by an inspection of my baggage; to satisfy themselves that I had no materials for barter with the Tagish or Stick Indians, as those who inhabit the interior are named.

Nothing was stolen. I have always found the red man was no pilferer, however fond he may be of duplicity and deception in small matters.

When the natives are all gone, those interior regions which are only attainable on foot with pack-carriers or packers will become more difficult of access, because now these Indians (broken as they are by disease) can yet carry heavier packs than a white man. They can travel farther on foot and endure greater hardships. They do not require so much in the shape of clothes and bedding. Their dried salmon, which they carry as food, weighs little, and they are satisfied with that. They are able moreover to supplement this with many kinds of roots, herbs and fruits which are eatable. I was endeavouring to learn from the Indians some of these useful secrets, for I have not yet met a white man who had *much* practical knowledge of these things.

The natives are steadily and surely disappearing in many localities along the coast, owing to causes that I will allude to presently. But now, while the Indian still exists, I would personally undertake, with sufficient funds, to reach any portion of north-west America, or to cross the continent from any one point to any other point.

Formerly the different tribes were afraid to quit their tribal territory, but now Indians can be found willing to accompany the white man through regions which are as strange and unknown to them as to him. Some, for instance, have accompanied miners as far as the mouth of the Yukon, and returned home by way of San Francisco.

I have stated that, in some districts at least, if not in all, the Indians are decreasing in number. This is the case as regards the once powerful Chilcat tribe, with whom I had to deal. Their decrease is partly owing to various epidemics and disorders, but greatly (and I fear chiefly) at Chilcat due to the importation of large quantities of whiskey. I represented what I had seen to the Governor of Alaska. The laws dealing with the subject are severe enough, and if they were even partially enforced the evil would be at least mitigated. I am glad to say things are not so bad in British territory along this coast, but at Chilcat they are as bad as they can be.

Indians sometimes came to my camp suffering from the effects of impure spirit—which can be obtained in any quantity in the neighbourhood of certain salmon-canneries that I could name—apparently merely for the sake of the moral comfort and support they seemed to obtain from the presence of white men who had no whisky in their possession, and could *not* supply them with what to them is poison.

These Indians rate their services at a very high figure. So long as

they have enough tea and sugar and hard tack for immediate use, they have no particular desire to work. Nor do they seem to lay anything by. A dollar only means so much sugar or flour to be purchased at one of the trader's stores down at salt-water. The Chilcoots, for instance, in 1887 refused to convey the effects of Mr. Ogilvie over the Taiya Pass, an affair of three days, for less than twenty dollars per hundred pounds; they subsequently accepted half that amount for going two-thirds of the distance; but I rarely found them to take less than whatever price was first mentioned, either for a purchase or for wages. This summer the Chilcats charged Messrs. Wells, Schanz, and Glave no less than forty dollars per hundredweight for provisions packed to Lake Arkell—some twenty men, women, and boys receiving more than eight hundred dollars for a week's work. I was therefore unable, owing to lack of funds, to employ the Indians to any large extent, or even to have them accompany me at all beyond a certain point; and we had to depend upon ourselves and do our own transportation in consequence, by packing our provisions and tents upon our own backs—the most fatiguing and laborious work with which I am acquainted.

Knowing that this might be the case, I had brought three men with me from Vancouver Island, engaged to accompany me as packers; one was an experienced woodsman from Ontario, expert with axe and paddle. From pure love of mountaineering, he would employ the bye-days, when we were not advancing and shifting camp, in climbing alone the loneliest and highest of the unknown peaks around us; innumerable grouse, and more bears than one, did he add to our food-supply. His name was John L. Hammond. Another of my men was half Kwagiutl Indian and half Sandwich Islander—not a promising mixture; yet he came to me strongly recommended by Mr. Hall, an envoy of the Church Missionary Society living at Alert Bay on Cormorant Island, and I had every reason to be satisfied with him. The third I found unequal to the hard work, and unwilling to what he called demean himself by learning from those he deemed his inferiors, so I sent him back at an early period of the expedition.

Our point of disembarkation was an establishment for canning and preserving the flesh of one of the varieties of salmon which are so numerous upon the Pacific coast. This was known as the Pyramid Harbour Salmon Cannery, so called from a curious conical-shaped island below low-water mark in the bay, where I was hospitably entertained by the manager.

We were now at the most northerly point of what is known as the Inland Passage. The distance from this point to the open sea is no less than 370 miles. This narrow salt-water inlet is enclosed on both sides by very steep snow-clad mountains between 5000 and 6000 feet in height, and has been named Lynn Canal by the American survey. It is remarkably straight; there are several glaciers upon both sides, some

high up, and some descending to the sea; at the head it forks into two smaller inlets, the Chilcoot Inlet on the right-hand side, or towards the east, whence the Taiya Pass leads to a branch of the Yukou; and the Chilcat Inlet on the left, or west, which was entirely unexplored as regards the passes into the interior as well as the interior itself. I must not forget to mention that one white man, Dr. Krause, had already ascended to a certain point and produced a fairly accurate map of the route he followed.

The only canoe procurable was not large enough to contain all the party. It was to be navigated by a lame Indian and his boy, and was to convey us up the river for about 25 miles as far as the last and largest of the Indian villages. I followed the shore on foot as far as the mouth of the Chilcat river, a distance of six miles. The mountains descend very abruptly into the inlet; although the water is muddy and brackish owing to the numerous streams and glaciers, and not over 20 feet deep, yet in places the beach is passable only at low water, while in other inlets I have found for miles together that there was no beach or ledge on which one could even land, but that the cliffs, worn and corrugated by the waves, descended sheer into deep water. The snow was yet deep, and the canoe had gone across the bay to the mouth of the river, and we had the greatest difficulty in making our way along the shore. The snow was also soft, the moss and trees damp and rotten, and the granite cliffs almost perpendicular. The crannies and cracks within reach of the waves were completely filled in places with the bodies of small fish resembling the oily oolachan, which is netted so largely in the neighbourhood of the Skeena river in British Columbia, farther south. The scenery was grand, and alpine in the extreme. It was the commencement of May, but the land had hardly yet emerged from the grasp of winter. The United States chart places the head of Chilcat Inlet some nine miles higher up the valley than is actually the case.

In the lower part of its short and rapid course, the Chilcat river hugs the left or eastern side of the valley, leaving an expanse of valley bottom on its right bank some four miles wide, consisting of stones and brushwood, which becomes covered with muddy water during the summer from the melting of the snows. Having rejoined the canoe, we camped on some high ground on the left bank near some Indians, who supplied us with several pailfuls of sticklebacks, small and very beautiful little fish, which they were capturing in great numbers in the eddies with a scoop net, but covered with the most formidable spines, which made them useless for eating except in the form of soup.

After three days of paddling, poling, hauling, towing, and wading, we reached Klokwan, and were immediately surrounded by a crowd of natives.

The weather was cloudless, and the sun so warm that from all the glittering pinnacles of the mountains on both sides, but chiefly on the

north, avalanches were falling almost incessantly with a sound like distant artillery; but the masses of rolling snow, when seen, looked very small, and seemed to slip down slowly when compared with the great volume of sound they produced. They seemed to keep to well-defined tracks, and sometimes assumed the appearance of white waterfalls, at other times of masses of froth or dazzling foam surging and boiling up together.

The Indians are fond of burying their dead in impressive spots, or amidst grand scenery, or near some freak of nature; as though in some natural mausoleum. For instance, in Vancouver Island and British Columbia I saw their remains in boxes on the summits of the loftiest cedars and firs; in Chugak, or Prince William Sound, their mummies are deposited high up on the face of beetling cliffs. Here on the mountain, about 2000 feet above the village, under a noticeable bluff, in a cavern, I accidentally came on a quantity of carved coffins partly destroyed by animals, and so old that they crumbled at the touch. In the village of Klokwan there are many wooden mausolea, chiefly of *shamans*, which are almost as large as some of the houses amongst which they are situated.

I experienced no opposition from the chief, a stout hale-looking Indian named Kintaghkoosh. He owns several large huts, in front of which are a flagpole and two old Russian cannon, and has a large amount of blankets and other kinds of wealth stored away in boxes of all shapes and sizes. Here some of my surplus supplies were deposited in safety.

The number of inhabitants at Klokwan, according to the last report, is about four hundred. There is no mission now nearer than Juneau, but some years ago a Protestant mission was established on the promontory which divides the Chilcoot and Chilcat inlets, which was abandoned owing to the very unpleasant conduct of the Indians.

The Roman Catholic priests have had much success in securing the attachment of the Indians, especially in British Columbia, in the interior beyond the belt of the coast rains, where the climate is drier and they possess cattle and horses, and are altogether happier and better off.

Northwards from California along the whole coast, as far as Behring Straits, no missionary to the Indians has had any marked degree of success except Mr. Duncan, and that is due to his personal qualifications. Now he has crossed into American territory and his Indians have followed him, and upon one of the large islands they have founded a new village.

From Klokwan I followed the Chilcat river upwards to its junction with a large stream, which I named the Wellesley river. I found afterwards that it had an Indian name—Klaheena. Up to this point we had very severe work towing and poling against the velocity of the current. The low temperature of the water in the morning made the continued wading quite painful—37° Fahr.

It was necessary at starting in the morning to see that the canoe lay

perfectly level in the water by properly arranging upon the bottom the oil-canvas sacks containing our supplies of food; the tow-rope had next to be attached to one of the cross-pieces, at a distance from the prow of one-third the total length; after which I seated myself in the stern with a paddle as steerer, while the others towed. At other times I took turns at the tow-rope, while two of the men who were expert at poling against the stream, remained in the canoe for that purpose.

At some points where I measured the speed of the stream it reached nine miles per hour, and our progress against it was very slow and exhausting. Sometimes we had to cross where the water was too deep for the pole to reach the bottom, and while paddling over we would be swept downstream half a mile. If the bow or stern were the lowest in the water, that portion grounded first, and the other end would be whirled round by the force of the current. Nor was it easy to gather up the rope and leap out upon a shelving bank of loose pebbles, past which the craft was being whirled with arrow-like rapidity, and then to hold on.

Under such circumstances bungling would be followed by a cold bath at a temperature perhaps of 37°.

I found roughly that these rivers increased in swiftness and volume from noon to midnight owing to the melting snow, especially on warm sunny days. The temperature also increased about six degrees towards evening. The light rains we experienced seemed to have no effect in raising their level. After a week of rainy weather I found the Klahena a foot lower, but a few days of warm sun caused a rapid rise, distinct from the daily fluctuations in level. Many of the valleys showed signs of having been excavated and worn by glacial forces.

Every day a strong breeze sprang up about noon, and blew steadily till evening up the valleys, and in a contrary direction at night. This was chiefly observed during fine clear weather. Similarly on the salt water inlets along the coast a breeze generally blows inland from the sea on fine days, but in winter it prevails in the contrary direction. I observed by the motion of the clouds that this was often independent of the direction of the upper air-currents. It is a curious fact on the Pacific Coast of Alaska, as I have frequently observed, that a west wind brings fine weather, and an east wind brings rain, without reference to local winds.

The Chilcat canoes are made of cotton-wood, and are remarkably tough and strong. Some three or four days I remained camped in the same place below the pass, which we employed in felling a large cotton-wood tree and hollowing it into a very respectable canoe, using for the purpose three axes and an adze, and subsequently filling it with water, into which we dropped heated stones, rendering it so pliable that we were able to stretch it to a convenient breadth. The largest of the Chilcat canoes, however, measuring thirty feet in length, are made of cedar, and come from British Columbia, usually from the Queen Charlotte Islands.

A risk to which the canoes were continually exposed was that of contact with blocks of ice floating down with the current, which were difficult to see, especially round bends, or in the foam and waves of rapids. We also had to walk upon the crust of ice while towing, bordering the stream like white walls, which the water had so undermined that pieces fell off with an appalling splash like small bergs, but always clear of the canoe.

We obtained some fine fish, salmon-trout—not salmon, for the latter had not yet arrived—caught by striking hither and thither at random in the turbid water with a long hook.

Another difficulty, and a peculiarity of these Alaskan rivers, is the enormously wide beds in which they flow, strewn with gnarled and jagged snags, and roots firmly embedded in the gravel, which, when hidden, form a serious danger, which we could not escape, for one of my canoes and a raft were capsized from this cause, but most of the contents were firmly lashed, and the occupants got safe to shore with a complete ducking. One craft was abandoned, the other grounded on a shallow, and was recovered.

These accidents give an idea of the nature of Alaskan and British Columbian rivers on this coast.

Though the Chilcat natives are accustomed to their native rivers, I found that on their trading journeys into the interior they left their canoes, or only took them a short distance, preferring to travel on foot with their baggage tied upon their backs, though the trail was of the very roughest kind, and they were constantly forced to wade from one side of the stream to the other by the encroaching cliffs. I observed them in crossing usually hold on to a long tree or pole in parties of five or six, the strongest man being up-stream to break the force of the water, a plan which we afterwards followed with advantage when we had to cross the Kilaheena.

The Indians also preferred to wade in place of forcing their way through the bush, which was very dense, when there was any choice in the matter. In choosing a place to ford we bore in mind that where the river was swiftest and broadest there it was also shallowest, and that by carrying a heavy stone, when we had no packs on our backs, we were less likely to be swept off our legs.

On our progress we greatly improved the Indian trail by the use of the axe. It was very faint, and frequently disappeared altogether.

In order to obtain a panoramic view of the country, I made a partial ascent of several high mountains, to which I gave names. I found the brush thickest near the base, and also immediately below the snow-line, caused perhaps by the increased dampness of those portions; in the central portions, along a zone ranging from 1000 to 3000 feet in breadth, it was not so tedious to penetrate, excepting on account of fallen trees of large dimensions, and that unpleasant plant, growing to the height of

a man's chest, known as the devil's club, and covered with fine loose barbed prickles.

Where the stream united shallowness to great velocity, I found it the best plan to tow with one rope fastened to the bows of the canoe and another attached to the stern, which enabled us to direct its course without the necessity of anyone remaining in it.

I found that the starved-looking Indian dogs, who are in the habit of greatly resenting the presence of the white man, were made to carry loads of 25 lb. in saddle-bags when their owners made a journey; little children, too, of eight and nine carried packs proportioned to their strength.

We first enjoyed ten days of perfectly fine cloudless weather, a very unusual thing for this coast. This was followed by nine days of clouds and rain, which caused the river to fall almost as much as the warm weather had caused it to rise from the melting of the snows. But by this time we had almost got beyond the region of the coast rains, and felt the sheltering influence of the great snowy range, including Mounts Fairweather, Crillon, La Perouse, and Saint Elias, which lay between us and the Pacific, and the amount that fell was small, though the weather continued dark and gloomy.

On May 15th, while I was seated writing beneath an arrangement of fir boughs to keep off the rain, there came a slight earthquake shock, and the structure descended gracefully and deliberately upon me. From beneath the ruins I observed a little Indian boy, who was hoping to pick up any trifles we might throw away, help himself from our supper. If this was not quite in accordance with my previous estimate of the Indian character, it must be remembered that this was only a child, and I have reason to believe that he was desperately hungry.

However, soon after the Indians killed a fine black bear, and some days later Michael Kalamo, whom I mentioned as being half Kanaka, half Kwagiutl by descent, killed a black and also a very large brown bear; and Hammond killed a black and a cinnamon bear. We had previously seen numbers of bears, and on one occasion I saw five at the same moment. In fact, I characterise the White Mountains, as well as this entire district, as the greatest bear country I have yet visited.

We found no traces of gold in paying quantities, but a great variety of blocks of variously coloured marbles, of which some of the moraines were entirely composed.

North of the Fraser the only rivers which boast of any length are the Skeena, the Stikeen, and the Naas. All the others are short and rapid. So we found that the Kilaheena as well as the other branches of the Chilcat soon became mere mountain torrents, and we had to abandon canoe-travel and pack our food upon our backs.

We had previously manufactured two sledges of different sizes, and

wherever there was any snow remaining we were able to drag our things along instead of carrying them. We commenced to do this on May 7th, and used them at intervals for the next seven days as far as Camp 9, after which the snow had so far melted as to make even the labour of constant pack-carrying preferable to that of conveying the sledges from one vanishing snow-patch to another.

I thus realised that it was easier to travel in this country in winter than in summer. The snow was quite hard, and although I had provided snow-shoes for the party, they were never required, as they would have been in winter-time. High up, however, near the mountain summits, I found the snow soft. A much greater load can be dragged in a light sled over the snow than can be carried on the back.

On May 8th I explored the ground ahead of us for a distance of five miles, following an exceedingly faint Indian trail through the forests, and then, guided by the sun, made my way back to the river through the densest brush and thickets of devil's-club thorns, with long elastic stems covered with barbs, which had to be pushed aside.

I had dismissed the Indian canoe as soon as we were able to use the sledges. But now I found the brush so thick and the torrent so dangerous to wade, and the snow patches so far apart, that I was obliged to return in person on foot to Klokwan Indian village to hire a canoe once more, trusting to meet with no streams which we should not be able to ford or swim, and that the natives would ferry us over when we appeared opposite Klokwan without blackmailing us. The distance we had previously ascended by canoe I now retraced by land, guided by the sun and by the mountain tops, pushing by main force through the bushes, plunging into cold streams, crossing others by means of fallen trees, or threading our way through a network of marshes.

On arrival late in the evening opposite Klokwan, I hailed some dusky figures in hopes of finding a Charon, expecting they would demand ten, fifteen, twenty dollars for fetching us. In anticipation of this I carried an air-cushion, with the help of which I should have swum the river. To my agreeable surprise, an Indian immediately poled his canoe upstream, and then quickly paddled across and downward towards us.

That no advantage was taken of our distress I found to be due to the presence of the American expedition, which had just arrived, and with whom I was already acquainted. I purchased a canoe after some difficulty for fifteen dollars, and next day, with a fresh supply of food, we reached Point Christopher, as I had named the bluff on which our camp was placed, after twelve hours of difficult and laborious poling and towing against the current.

Meanwhile, my other two men had been cutting a good trail along the bank, both being very expert axemen.

Next day some Indians came into camp, having crossed the Pass from the Altsehk river, carrying heavy packs. One of the women was

a Yakutat. They pointed out to me the position of the pass, and explained that other Indians had remained a short distance up the valley, in order to manufacture some cotton-wood canoes. They stated that it took seven days to reach Dry Bay, and that there were canoes upon the Altsekh, which shot down to salt water with great velocity. This agrees with the account of Glave and Dalton. We had made a bridge over a branch of the Wellesley by felling a tall tree and floating one end across. In the morning, when the river was always lowest, the trunk was a foot above the surface of the stream, which was at that point seven feet deep. Across this the Indians stepped without the slightest hesitation with their burdens, turning both feet towards the same side in balancing themselves, not outwards. Others turn them inwards.

On May 12th I ascended to a height of about 4000 feet on the sides of Mount Glave, in order to obtain a view of the surrounding mountains. The softness of the snow interfered with our ascending higher. I was accompanied by Michael Kalamo, and hastened to recross the river before noon on account of the daily flood from the glaciers. Above the timber-line we sank waist-deep in the snow between the patches of willow-brush. On the east lay the main branch of the Chilcat river, less turbulent than the Wellesley, and divided into many channels, while in the distance, on the south, rose the summits of the great snow range of the coast.

The daily temperature was increasing. On May 2nd at sunset, the thermometer marked 40° F., a week later at the same hour 50° F. On the 13th we struggled all day against the stream, towing with one rope, then with two. A cotton-wood tree I measured girthed thirteen feet. The shallow water was full of young salmon about an inch in length, playing amongst the carcasses of their dead ancestors. In the autumn millions of salmon are left stranded in the shallows and on the sand-banks where they die; these were now in various stages of decomposition, which made one wish for something less antiquated. Many had been half eaten by bears. The velocity of the current was here nine and a half miles per hour. Next day my men hunted and wounded a she-bear on the side of a mountain I named Mount Shanz, and the following day I again ascended to a height of 5000 feet on Mount Glave in search of fresh meat.

We were delayed by bad weather for some days. On May 22nd, I made an exploratory trip ahead of the expedition with my half-breed. The weather was still damp, and doubtless on the coast it was raining much more heavily than here, but we had now eaten down the provisions to such a point that we could manage to carry most of what remained together with blankets, axes, and other necessities by making double journeys. On the 23rd I started with one man to select a camping place. We carried about fifty pounds each. I preferred the bed of the river, frequently wading. My companion kept mostly on the bank,

where I could trace his progress by the loud crackling of the branches as he forced his way along. For more than a mile we were obliged to creep along the edge of the stream, under steep clay banks, from which pieces were continually dropping. Then we emerged into a district where the bushes grew more thinly. I saw large blocks of pure white marble scattered about, some of large dimensions, mixed with marble of various colours, finally camping near Marble Glacier. On the 26th I ascended alone as far as snow-line on one of the mountains at the foot of the Klahena-Altsehk Pass, and obtained a view of some distant ranges entirely covered with snow, and without any rock showing, and bare of timber. The bases were not visible. About five miles above my tenth camp the valley divides, the left or western branch leading to the pass. At this point the country is more open and progress easier. I counted eight glaciers in valleys opening into the Wellesley or Klahena on the right bank, but none on the left. The distance from our camp to the mouth of the Chilcat river was about 60 miles.

A few days later a white man, to my surprise, who had recrossed the pass alone, suddenly arrived in my camp. He said his name was Meehan, and that with two Norwegians he had crossed the pass in February, having been over it previously, and that dragging their food on sledges, they had descended the Altsehk to a point where a large river, called Kla-tsa-kult, came in from the westward. Mr. Glave also noted this large river, which will probably be the route followed by future explorers.

They had found no indications of gold, and had abandoned most of their baggage and provisions, as the disappearance of the snow had made it necessary to "pack" their things instead of using sledges on the return journey. He had outstripped the others who had heavier packs. I took him with me to the coast. Of his two companions one was drowned in the Klahena a few days later, at a spot where we ourselves experienced great difficulty both in ascending and descending. Later on I saw the survivor. From these two men I learnt that just over the pass there are some houses used by the Chilcat Indians as stores for their trade with the tribes of the interior. The Chilcats and Chilcoots will not allow these inland tribes to approach the coast with their furs, but insist on acting as middlemen between them and the white traders. This was the reason they wished to assure themselves whether or not I had come to trade with these inland tribes. I might further illustrate this by referring to the difficulty Mr. Ogilvie experienced in persuading these inland, or Tagish Indians, to commence the transport of his effects from the point where the coast Indians had deposited them, as it was yet in the country where the latter claim exclusive rights. They seem no better than slaves to the Chilcoots, and are afraid of offending them. Many of the Chilcoot and Chilcat Indians have Tagish wives, some of whom I saw, and remarked a distinct difference of type, though it was

hard to define in what it consisted from so few examples from which to judge.

I think it right that I should mention what has been done in this district by Messrs. Wells, Glave, and Shanz, who followed in my tracks as far as Klokwan, the great Chilcat village I have alluded to. I had already reached a point some miles above, in the Klahheena valley, but knowing of their arrival I returned in order to learn which route they proposed to take towards the unknown country ahead of us. As I had already chosen the Klahheena tributary, learning from the Indians that that was the best way to the Altsehk, they, in order that as much fresh ground as possible might be traversed, continued up the main Chilcat river with a large number of Indian packers, crossed the divide and discovered and named a large lake in British territory, Lake Arkell. Here they separated, some of the party constructing a raft and commencing the descent of the Takeena, which flows into the Yukon. I have not yet heard of their return.

The other two, consisting of Mr. Glave, who was recently in charge of Equatorville Station on the Congo, and Dalton, who was one of the men engaged to accompany us to the Mount Saint Elias in 1886, succeeded in reaching, in company with some Indians who were going in that direction, a branch of the Altsehk other than that which leads from the more direct pass, which I may claim to have discovered. They then descended the river in a canoe with some natives whom they found willing, and reached the coast at Dry Bay, and thence proceeded to Yakutat by way of the lagoons which are found between the mountains and the sea, and returned to civilisation by a chance trading vessel. I recently saw Mr. Glave in New York, and learned much from him about the Altsehk.

A party of American surveyors also has passed this summer amongst the glaciers in the neighbourhood of Yakutat, and have apparently determined the height of Mount St. Elias as nearer 13,500 than 19,500 feet, which the American Coast Survey had previously made it.

Reaching the head of Yakutat Bay on June 18th, by the 1st of August they were at a point half-way between the bay and St. Elias; on the 21st they had reached the base of St. Elias, probably on the east side, and at three the following morning commenced the ascent. The weather had been fine for the past ten days, but after a few hours, snow began to fall, and continued for thirty hours, and they had to return without having reached the summit. They made another attempt two days later, and again a storm came as suddenly as before.

A glacier which they estimated to measure a thousand square miles lying at the south base of Mount St. Elias, they named the Piedmont. But I think this must be what the American Coast Survey had already named Malaspina Plateau, the western part of which we named the Great Agassiz Glacier. With regard to the new height of Mount St.

Elias, Mr. Baker who, with Mr. Dall, made the previous triangulation which gave 19,500 feet, is spoken of as one of the most accomplished mathematicians in the United States Survey. Our Admiralty chart gave 14,975 feet, the Russian chart 17,854, Grewink 16,754, D'Agelet 12,672, and I stated in 1887 that it seemed to me not to exceed 15,000 feet.

I have thus described to you a portion of this most interesting part of North America, which in grandeur of natural topography far exceeds the rest of the continent, and have touched upon the various explorations which have been carried on there this summer. Owing to the extremely mountainous character of the country, its resources are practically limited to minerals, fisheries, and timber.

There is large area of country in the neighbourhood of the headwaters of the White River of which we know nothing. I am aware that the members of the American exploring party, as well as myself, cherished the secret hope of being able to reach that country.

Some of the reasons why this White River country is interesting though mysterious are these: first, the widespread and comparatively modern layer of volcanic ash, or pumiceous sand, deposited over a large area of the Upper Yukon basin, observed by Dr. Dawson in 1887. The position of the greater mass of the deposit seems to show that it was derived from the westward. The nearest volcano is Mount Wrangell at the forks of the Copper river; but the Indians report the existence of a burning mountain near the headwaters of the White River. This layer was observed in one place on Lewes river to rest upon stratified sands a few feet thick, which in turn overlies a mass of drift logs still quite sound and undecayed. That the eruption was on a great scale is evident from the extent of deposit. Then again, the Yukon has no tributaries of any size on the left bank below the Takeena for a great distance, with the solitary exception of this White River, which fact, taken together with the general appearance of the country in that direction, as seen by Dr. Dawson so far as he was able to overlook it, seem to show that the basin of this river must be comparatively low. Moreover, since the coast ranges in British Columbia and Alaska cause a belt of very dry climate to exist immediately in their lee (where I might mention that artificial irrigation is necessary to agriculture), and as the St. Elias Alps are exceptionally high and snowy, this White River country should prove exceptionally dry and possess many remarkable features.

On the conclusion of the paper,

Dr. J. RAE said:—I regret to say that I have not been in that part of America of which Mr. Karr has given us such a pleasing and instructive account. The places that I have visited have nothing of those characteristics, with the exception of parts of the Rocky Mountains, where I have travelled a little; but I think Mr. Karr does not allow sufficient advantage to the sledge. To my mind it is easier to haul 150 lbs. on a sledge than to carry 50 lbs. on your back, particularly over snow. The weight on the back sinks one down into the snow, while the sledging is a much

more easy process. For instance, on one occasion I hauled a sledge carrying 60 lbs. or 70 lbs. for 1100 miles, and our average day's journey was 24 miles. The snow was in fairly good condition, and we came back well. If I had been carrying that weight it would have been very difficult. I am sorry I can give no information as to work over such a very rocky country as Mr. Seton-Karr speaks of, with one exception—i. e. travelling on the west coast of Melville Peninsula, where it was impossible to haul a sledge, and we had to carry on our backs everything we required to use. Fortunately we had no tent to carry, because on these occasions I always built a snow-house, which saved an immense deal of labour, and with a single blanket in such a house one could always keep warm, even in the coldest weather. My men were all able sledge-haulers and carriers of the Hudson Bay Company. That was the most severe work I ever had in carrying a heavy load (about 500 miles) over a rough country. I trust you will excuse my making these few remarks.

MR. DOUGLAS FRESHFIELD:—I look round the room and see with regret that Mr. Topham, who read a paper last year on Mount St. Elias, is not present. I have myself no claim to speak from any personal acquaintance with the North American Continent. But I may, perhaps, say a few words on two matters that have been touched on by Mr. Seton-Karr to-night. He speaks of the curious sudden floods in the glacial streams. They may probably be accounted for in the same way as the floods from the Aletsch Glacier, which arise from the bursting of the Marjelen Sea—i. e., by the sudden breaking open of glacial lakes, many of which were noticed by Mr. Topham.

Mr. Seton-Karr has also told us that the last American expedition has knocked 4000 feet off the head of Mount St. Elias, which we had believed to rise 18,000 feet above the sea-level. Now, I do not think we ought to acquiesce hastily in this diminution of Mount St. Elias. Mr. Dall, the surveyor who is responsible for the original survey, has stated that his height does not depend on one observation but upon several. The matter is being entered into fully in America, and is at present *sub judice*. I would, however, point out that another surveyor, Mr. Allen, measured the neighbouring Mount Wrangell, and made it over 18,000 feet. Mr. Topham took a series of measurements on Mount St. Elias, and having climbed above 11,000 feet, estimated that the peak rose at least 6000 feet above him. I know a great many climbers who have under-estimated the height of a mountain above the point which they have reached, but I have never known a climber who, having only 2000 feet above him, has estimated it at over 6000. It is against probability and human nature that a climber should do so, and I shall believe in the greater height until we have much better evidence to the contrary. There is another argument in favour of Mount St. Elias. The recent attempt to reduce the height of the Mexican volcanoes to 15,000 feet has failed, and they have been restored to their old height of over 18,000 feet. In fact, it was perfectly clear to anyone acquainted with the climate of Mexico that the mountains must be above 15,000 feet in height in order to account for the glaciers upon them. With all respect for the ability of American surveyors (which, it has been said, has reduced one mountain to a depression in the earth's surface), I still hope that we may long be able to look upon Mount St. Elias as the mountain with the greatest sweep of glacier on the face of the globe.

THE PRESIDENT:—I think most of us are very much obliged to Mr. Seton-Karr for having taken us for one night at least away from Africa. He has long been favourably known to the Society, and to-night he has read to us a very interesting paper. I trust that he will have the good fortune at some future period to be able to return to Alaska, of which he is much enamoured, and to make even greater discoveries than he has already made. You will, I doubt not, wish that I should, in your name

and my own, express our most sincere thanks to him for what he has given us to-night.

Mr. SETON-KARR:—I am very much obliged to you for your kind thanks. I agree with Dr. Rae about the sledging, and think his journey of 500 miles a very wonderful achievement, and one which bears out what I have said as to the necessity of Indians in Arctic American travel. I have seen a communication from the surveyor who made Mount Wrangell 18,000 feet, made since his measurement, in which he reduced the height somewhat. Mr. Freshfield alluded to the American volcanoes. From Alaska I came home by way of Mexico in order to see these volcanoes, and ascended Popocatepetl, but was unable to go up "Orizaba," and quite agree with him that they are quite as high as originally stated.

Notes on the Country lying between Lakes Nyassa and Tanganyika.

By DAVID KERR CROSS.*

The traveller on reaching the north end of Lake Nyassa from the south, cannot but be impressed by the beauty of the country opening up before him. On the east the lake is enclosed by the towering heights of the Livingstone range of mountains, which rise as a rugged wall to 8000 feet above the level of the lake, with sides well wooded, and dipping in some places as sheer precipices into the water. Between him and the dark line of the distant mountains there stretches the flat N'konde country, which runs along the north and west shores of the lake, and may be from 12 to 20 miles in breadth, stretching east and west from Karonga to the foot of the Livingstone range of mountains. In appearance the country is more tropical than anything to the south. Borassus palms are observed shooting their tall forms and umbrella-shaped heads above every other form of life. Large sycamore trees are numerous, with a few giant baobabs and extensive groves of bananas and plantains. On the whole, the scenery is beautiful, and invites the traveller who has been sweltering under a burning sun to rest in their shade.

This N'konde plain in its whole length, together with the hill-country behind, is occupied by one people, the Awamwamba, who are subdivided into families, as the Awankonde, Awaniakyusa, Awakukwe, Awabundali, and the Awamesuko. Their country is acknowledged to be one of the richest of Nyassaland. In part, as along the lake shore, it is flat and somewhat marshy, but very rich, while the country behind consists of high hills, rich valleys, and undulating pasture-land. No area of the lake is so well watered as this; indeed, it is the principal water supply of the lake, there being no less than nine perennial rivers, all of considerable volume, rushing from the hills across the plains to the lake.

* For map, see 'Proceedings R.G.S.,' 1890, p. 776.

Two or even three crops can easily be raised in the year. For some months, as at the end of the rains, the lower parts are under water, but the higher levels of even these plains are occupied by the natives, and covered with plantations of bananas and gardens. These plantations are the delight of the people, and usually occupy the higher ridges of land, and are planted in long lines. You may walk from sunrise to sunset and never be outside the cool shade of these bananas.

Hidden in these groves, as in a palm section of a botanical garden, is the black man's home. It is circular, built of bamboo and small round bricks. The roof is of thatch, which greatly overlaps in mushroom form, while the door is so large that a person can walk in without stooping. The door-posts are painted with red, yellow, and white clay, while rude figures of cows are painted on the inner wall. Inside there is an air of comfort. The fire is made in the centre of three round stones. Giant pots for holding grain are on one side, while baskets, mats, fishing-nets, spears, shields, and other paraphernalia are hung on the wall. In one corner is a rude bedstead, raised a foot or two from the ground, covered with mats woven from the banana. These mats are the black man's blankets. Such are the houses of the married people. Unmarried men—Wankenja, as they are called—live in long-shaped houses, often 50 or 60 feet in length, and built of bamboo intertwined with reeds.

Here no man is allowed to marry till he is about thirty, and able to buy a wife. The little boys spend their mornings sweeping up the villages. No weeds, grasses, or decayed leaves are allowed to lie about, and everything is sweet and trim. The country abounds in cattle, in which the black man of this tribe has his wealth. The cattle are noble-looking animals, with the haunch above the fore-shoulders, and are big in appearance. These herds are tended with the greatest of care, housed properly, washed and brushed down at regular periods. They are kept in separate houses, which are long, like the apartments of the unmarried men, and usually the herd-boys sleep with the cows—the herd on one side and the cow on the other.

I have been greatly interested to see the amount of knowledge of cattle-breeding these people possess. Their language is wonderfully rich in terms descriptive of cattle. Cattle diseases are known, and treated so perfectly that the veterinary surgeon of Europe might here learn something of them. To look across the plain or down the valley and see two or three herds of these beautiful animals browsing in the long grass, and to hear the rude tinkle of the iron bells (for each cow has a bell), convinces one of the peacefulness and happiness of these primitive people. Or to look in upon one of these villages hidden among the banana trees in the sultry afternoon, to see the men stretched at full length lying on mats or banana leaves, the women grinding the flour for the evening meal, and the cattle standing in the smoke of the

dry cow-dung fires chewing the cud, unmolested by flies, is a picture of primitive happiness that may even make us envy the black man's lot.

Everywhere food is abundant—bananas, plantains, sweet potatoes, cassava, or amayauyau as they call it, yams, Indian corn, beans, peas, millet and other seeds, wild fruits, wild grapes, tobacco, honey, milk, fowls, and beef. I have been able to collect over twenty different species of bananas, all known and named and put to different uses. This tree furnishes the black man with paper and twine; from the leaves he makes mats and blankets; from the fruit he makes flour, porridge, bread, and wine.

The people themselves in every respect accord with this scene. The men are stalwart, muscular, and well developed, while the women are round and fat. This simplicity of life is carried into the matter of clothing. Except for a few coils of brass wire round the middle and a few spears on the shoulder, the men are naked, while the women wear a little strip of bark cloth that may be as broad as three fingers. Out of compliment to the white stranger I have seen some of them wear a little strip of banana leaf, but beyond this they wear nothing.

From my varied experience with these simple people, and with the well-clothed Arabs and their followers, I do not hesitate to say which is the more modest, and affirm that as a general rule in Africa modesty is in inverse proportion to clothing. Much might be said about their manners and customs! One is apt to think people who are naked and black are coarse and unmannerly. My experience is quite the reverse. They are most mannerly and courteous. There is nothing that will enrage a chief more than want of respect on the part of his subjects. He demands and receives homage. If you enter one of these villages you are immediately accosted by a native—who has been lazily stretched at full length on his mat—rising, bowing, and clapping his hands, saluting you thus: "Isaga Mzungu"—Welcome stranger. If you should rest at his village he will hasten and bring a mat or a stool, if he has it. He comes forward, and clapping his hands, bows to you and salutes you thus: "Sawkire, sawkire, sawkire," while you too stoop and salute him after the same fashion. He then again bids you welcome, hopes you will stop and rest your limbs, that you will eat, and go in peace. He asks if you have slept, your head has slept, your limbs have slept, your friends have slept, &c., &c. By this time the news of your presence has been carried to the chief, who hastens to come and show his respects, and as he dare not come with his hands empty, he brings a sheep or an ox, a couple of bunches of bananas, a huge pot of thick milk or beer, which you courteously accept. On a return present being offered friendship is established, and you get the news of the day. If you mean to stop in the village you ask for a house, and invariably you get the best he has.

There is another form of salutation which I have seen practised on

the hills. There the chief usually occupies a raised seat, as a stone, and when the person about to salute him comes into his presence, he falls on his knees before the chief, clapping his hands, or if he is a poorer man, he goes flat on his back, and, clapping his hands, addresses the chief thus:—"Thou art my father, my protector, I wish to do you reverence." The chief leans forward and addresses the man thus:—"You do me honour, you do me honour, you do me honour," all the while clapping his hands. When two common men salute one another, they invariably take the axe off their shoulder, or the knife from out of its sheath. This knife is always carried in its sheath strapped on the upper arm. I have known of a big fight taking place among the people because a man when saluting another neglected to take his axe from off his shoulder.

Travelling across this plain, and country of bananas and cattle and naked happy laughing people for two days, will bring you to the foot of the range of hills. Ascending, you travel for a day across country covered with scraggy bush and grass and boulders of rock. Another day will bring you to an undulating plateau of great extent. On the east the Livingstone range of mountains rises as a wall, and runs north and west, ending in a great peak called Rungwe. On the west is the hill country of Bundale. These too meet in the Busango Hills (towards the north) occupied by Merere, and seem to be in continuation of those on the west and east. Behind and to the south you look across the great plain we have just described, which you see covered with dark-green plantations and heavy bush, while the smoke of many villages rises on every hand. Beyond these are the blue waters of the Nyassa.

We have now entered the country of the Awakukwe, another family of the people we have just passed. Their villages too are built in banana plantations which occupy the ridges of the undulating country. The plateau is cold, rich, undulating, and well watered. The soil is dark and soft, and no difficulty is felt in raising two, or even three crops in the year. Tea and coffee would grow admirably. It was of these uplands that Consul Elton made the following remarks:—"The country we have passed through is, without exception, the finest tract of Africa I have yet seen. There is nothing to equal it either in fertility or grazing land in Natal, the reputed garden of South Africa."

Leaving this plateau and journeying directly west towards the Nyassa-Tanganyika plateau, you cross two countries occupied by families of this same people. They are the Awabundali and the Awamesuko. Theirs is one of the most hilly countries I have seen in Africa. The mountain ranges run due north and south, and several of the large rivers of the north rise here, as the Kiwirwa, the Suwiswi, the Songwe, the Rufira, and the Rukuru. The banks of the Kiwirwa river are in some places 700 feet high. On one occasion I was led with my caravan up a very steep climb of little less than 4000 feet up the face of an escarpment

through a dense piece of forest, and that night slept in a village fully 8000 feet high. All day long your journey consists of continuous ascents and descents. You may make a descent, often through mist and rain, of from 200 to 400 feet to a ravine a few yards across, at the bottom of which is a noisy burn, with an opposite ascension to a similar height. In crossing these, very often the members of the caravan can talk to one another across the ravine while they are still so far apart.

For days you journey through valleys delightfully green at all seasons of the year, thickly planted with banana groves, terraced with well-tilled gardens, and giving pasture to many herds of cattle. The flat hills and mountain sides are under cultivation, and are fringed with imperfect hedges and threaded by paths to the mountain tops, or higher levels of cultivation. On looking to the sides of these valleys, you cannot but be struck at the wonderful degree of cultivation to which these interesting people have attained. Their gardens look like well-ploughed fields, all hedged in and wonderfully productive. All day long the herds of cattle roam on the hillsides and among the bananas, while the herd-boys play on their rude flutes made of reeds, or beat on their curious little drums. The men on these uplands are naked, or wear only a little apron of a foot square, or a strip of banana leaf, but the women are all decently clothed in bark cloth. Curiously enough, hand-shaking, or rather hand-grasping, is practised among them, as they salute one another with "Sawkire, sawkire." Sometimes, standing on these lofty peaks, you get a Pisgah-like view of the many miles of undulating country around. Down some of the valleys, as through a telescope, you see the great plain of the country of the Awaniakyusa people, while beyond, at a distance of forty or more miles, you see the blue waters of the Nyassa. It was of these high plateaux and grassy uplands that Consul Elton made the following remark, "We have now marched over forty miles through the most exceptionally favourable country for European semi-tropical cultivation I have ever seen."

In contrast to these words you will doubtless be reminded of the words of Professor Drummond in 'Tropical Africa,' where he gives a most gloomy picture, and you will recall the fact that he too travelled in the north of Lake Nyassa. Let me here say that I differ *in toto* from Professor Drummond. I know exactly every mile of the road he covered, have slept in the villages he passed, and know that he spent five months in all, from the time he reached Quilimane till he left it. That he spent two months at the north of Lake Nyassa, and covered a district that most of us travel in four days. He never saw these grassy uplands or fertile valleys that Consul Elton speaks of, but skirted their edge. Moreover, most of us hold that no one can judge of Africa unless he has seen it during the rainy season. This Professor Drummond never saw. One might visit the fairest parts of England during the winter and speak of its leafless trees, its withered grass, its songless birds, and be perfectly true

in his description. But that would be no true picture of this island. So Professor Drummond visiting Nyassaland during the dry season—our winter—speaks of its “thin, rather weak, forest . . . of low trees, whose half-grown trunks, with scanty leaves, offer no shade from the tropical sun. Thousands and thousands of miles of vast, thin, forest, shadeless, trackless, voiceless.” And his experience covers a distance of eighty miles from the north of Lake Nyassa.

The rainfall in these uplands is very great indeed, as is manifested by the fact that there are no fewer than nine perennial rivers, some of them of considerable volume, flowing into the lake at the north. It is these rivers, together with the great rainfall, that gives the country the appearance of perpetual spring. The autumnal fires that rage generally all over Africa are seldom or never found here—I presume on account of the excessive moisture.

In most places in Lake Nyassa the year can be divided into only two seasons—the rainy and the dry. Towards the end of October, when the sun is vertical, there may be a few days of heavy rain, but this can hardly be called the beginning of the rainy season. The rains really begin towards the end of November, being somewhat later as you go south. Usually the rains last till April or May. At some places the rainfall is 30 inches, at others it is 86 inches, while on the uplands where I have lived it is over 100 inches. In most places between the months of May and October there is no rain, when the soil becomes dry and parched and cracked, the trees are leafless, the grass withers and becomes yellow, and usually falls before the fires which sweep across the country in October. Each season has its own prevailing winds. During the wet season, from November to May, the winds (generally) are from the north and east, and bring with them the moisture-laden clouds from the Indian Ocean, while during the dry season the south and east winds prevail.

These remarks may apply to the Nyassa region generally, but it is quite different with the hill country at the north of the lake. There the contrast between the two seasons is not so marked, for seldom, even during the dry season, does a month pass without one or two showers, and accounts for the great rainfall—over 100 inches. For at least six months of the year the winds blow from the southern Indian Ocean, bearing the moisture of the sea and the vapours exhaled by a water surface on Lake Nyassa of 14,220 square miles, not to speak of Lake Shirwa and the marshy countries on the Lower Shire. These vapours on the high altitudes at the north of Nyassa meet the cold atmosphere which there prevails, and descend in copious showers of rain. While living on these hills, I have often seen two rain-clouds, one from the north and the other from the south, collide and dissolve in a deluge of rain on the neighbouring peaks, while the country adjoining was parched dry and bathed in sunshine.

As is well known, white ants prevail generally all over Africa. On these hills and upland plateaux of which I speak no white ants are found. The explanation given by the natives of this is the excessive amount of moisture. According to them, white ants do not live where rain falls every moon.

The journey from the north of Lake Nyassa to the Nyassa-Tanganyika plateau is usually made from Karonga along the Stevenson road, as this, on the whole, presents the best access to the plateau country. The first day is spent crossing the N'konde plain, which stretches from the lake to the hill country at an altitude of 50 or 60 feet above the lake. The lake itself is 1570 feet above the sea. This crossed, the road winds over rivers, through narrow passes, and round the sides of high hills for two days, when you emerge on the plateau. This part of the road was that which presented the greatest obstacle in its construction, and consists of deep cuttings and bridges; and the keeping-up of which presents the greatest difficulty owing to the floods of the rainy season and the bush fires of the dry.

The plateau on which we have now emerged maintains an altitude of 4000 to 5000 feet, and is some 170 miles in breadth. Entering it you look across a great expanse of open country that is fairly well wooded and watered. On the north there rises the Chingambo mountains, which run north and west. On the north is seen a high range enclosing the country of the Awasingwa, while directly west the plateau stretches as far as the eye can see. I have often stood on the high hills in Mwenemesuko's country and overlooked this plateau from an altitude of 2000 or 3000 feet, and the whole has appeared to me as if I were looking on a great lake with the distant hills as the shore. From a geographical point of view this plateau is very interesting. It is the watershed of the continent. Within $1\frac{1}{2}$ day's march I have stood on waters that run into Lake Nyassa, and into the Loangwa river (both of which eventually reach the Zambezi and the Indian Ocean) on the one hand, while on the other I have stood on streams that run south and west into the Chambezi, and on into the Congo and the Atlantic Ocean. The northern and western edge of this plateau is marked, as I have said, by a uniform wall of mountain range, the Chingambo Mountains, the peaks of which may be from 6000 to 7000 feet high. Its sides are furrowed by numerous streams, which flow south and west through great stretches of fertile level country, which unite in the river Chambezi, the eastern source of the Congo river.

North and east of the Chingambo Mountains there stretch undulating plains of rich grassy uplands, which are well watered by perennial streams. These may be 5000 feet in height, and present great expanses of park-like country, with here and there wooded clumps of fine trees. Being green, high, well-watered, and sparsely inhabited, they are ranged over by large game. Buffalo, deer, elk, wild pig, and zebra, are

to be seen. This country, with the hills to the east, is the watershed of two of the lakes—Nyassa and Rukwa or Hikwa. There rise from the Mumboyo mountains two rivers, both of which pass by the name of Songwe (I cannot say why), one running south and east to the Nyassa, while the other runs north and west to Rukwa. Here also rises another river, the Nkanna, which flows north and west, and joins the Saise which comes from the country of the Awamambwe and flows into Lake Rukwa at its south-west shore.

Various tribes inhabit these plateau lands, as the Awawandia, Awatambo, Awarambo, Awanyika, Awanyamwanga, and Awamambwe, all of which present features in common. Their country generally presents a marked contrast to the mountain country we have just described. The hills, bananas, rich grassy valleys, and cattle are wanting. The one country is high, very hilly, rich, and grassy, with few trees, but many bananas; the other is level and well wooded, with no bananas.

All the villages here right on to Tanganyika are what are called stockaded. That is to say, all the houses in the neighbourhood are built together in the form of a town, with a strong palisade of trees around, and a ditch 12 feet deep and 10 broad outside, while thorns are thickly laid. The site is usually on the side of a stream, or where two rivers unite. All the people in the neighbourhood live inside such a village with their cattle, sheep, goats, fowls, dogs, and every other belonging. The native knows nothing of sanitation, so pays no heed to it. Such a village can be better imagined than described. Naturally the people do not by choice take to such a state of existence, but are driven to it by their enemies. These towns are not numerous, one being found every three or four miles.

Seldom do the people make their gardens near their villages, but far off in the bush. Two months or so before the rains each man selects a spot on which to make a garden, and begins operations. He cuts down the trees on the proposed spot and around it for a great distance, raising all in a heap. He may thus cover an area of half-an-acre to the depth of 2½ feet. At the beginning of the rains these dried branches are burnt, and when the soil is softened by the moisture the ash is hoed into the soil. This is the only manure they adopt, looking upon every other as unclean. Thus are the trees pollarded for long distances around the gardens, and the country generally stripped of its wood. For miles often, between the villages, the country has thus a bleak desolate look.

Ironstone is found extensively, and in places old workings are observed. On one hillside I counted five smelting kilns standing in the bush not many hundred yards from one another. These stand fully nine feet high, five feet in diameter at the base, and three at the top, and are built of reeds and clay. Each will contain half a ton of iron ore. They use charcoal when smelting, and are well acquainted with the principles of the working

of iron. Spears, hoes, axes, knives are manufactured extensively. The ore found is the brown hæmatite, which is very hard and compact, and is often found in beds of ten feet thick. The banks and bed of the Songwe river in some places are formed of this ore. The skill and industry of these people are very great. Every village boasts of a few blacksmiths, and weavers, and workers in clay. Several looms are found in daily operation. Wild cotton, both bush and tree varieties, grows plentifully, and is woven into pretty patterns. Few cattle are to be found here, not because they do not thrive, but because of the near presence of enemies of the villagers. The people of these lands would all be cattle-breeders if they could, for they know how well oxen thrive in lands which are free from the tsetse fly, but the moment they possess this wealth they become a prey to the marauding cattle stealers. Here coffee and tea would grow extensively. Already I grow my own coffee, and eventually I hope to grow my own tea. I need not enumerate the produce, but may say that most African products are found here.

On the fourth of November 1889, with four personal servants and six bearers, I set out to visit Lake Rukwa, of which the people had often spoken. At first I had difficulty in persuading the men to accompany me, as the country was said to be very barren, with no water, and the inhabitants most inhospitable, the chief being known as a wizard, and a great slaver. Having overcome these difficulties, and provided ourselves with food, we set out. The first few days led us along the bank of the Songwe river, which runs into Lake Nyassa, and into the country of the Awanyika. Here I was joined by Mr. H. H. Johnston, who happened to be passing through this country on his way to Tanganyika, and we journeyed together. Travelling due north and a little east, over high country, we crossed several streams, as the Nkanna, which were now running west and a little north. This Nkanna is a large stream, and rises in the uplands near to the Mumboyo mountains, and runs west and a little north, where it joins the Saisi and enters Lake Rukwa at its south-west shore. Next day, when the sun was overhead, on rounding the brow of a hill, we got a magnificent view of this curious lake. Stretching in front of us as a great white sheet lay the Rukwa or Hikwa or Urukugha, or Leopold, as it has been variously named. On its eastern shore it seemed surrounded by a high range of mountains, which rose in ragged peaks or table tops. On its west shore rose also a thin line of hills, while away to the north we saw nothing but a thin haze of water, where the lake and the horizon seemed to meet. The lake would now be thirty miles distant, and we would be viewing it from an altitude of several thousands of feet. For hours we descended terrace after terrace, down steep inclines, until, when the darkness fell, we pitched our tent in the dry bed of a stream. Next day's march led us across the plain which skirted the lake. Such plains seem to be characteristic of most African lakes. At first it would be several hundreds of feet above the lake, but gradually it sloped to the water's edge.

This day's march was, perhaps, the most wretched that any of us had ever spent in Africa. The heat was intense, there was no water, no food, no shade, no sign of life whatever, save the form of a skulking native seen through the bush at a distance of several hundreds of yards. The plain seemed to be covered with nothing but the thorniest and wildest of acacia and ghastly euphorbiæ.

It was weird indeed as we pushed on through these still stretches of thorny bush. With much difficulty we reached the village of the chief, or the sultan, as many of his followers who could speak Swahili designated him. Unfortunately Mr. Johnston was compelled to retrace his steps next day without reaching the lake. His was not an expedition for work of this kind. Left alone, after much trouble, I persuaded the chief, Mwenewungu, to give me a house to sleep in, give me food and water for my men, and eventually guides to visit the lake. Mwenewungu's village is situated near the south-east corner of Rukwa on the river Songwe, which here meanders to the lake. Next morning, about 4.30, we set out for Rukwa. Life here usually begins in the small hours of the morning, with a long interval of rest during the heat of the day, with activity at night. If forced to be abroad at mid-day the people do not walk in the fierce sun, but progress by making a dart from the shade of one tree to that of another. Every man wore sandals made from buffalo hide.

On the way I crossed several rivers, all of which were dry, but as they had the remains of native bridges of considerable width, I take it that at one time they were small rivers and not mountain torrents. I never before saw so much game as on this plain, attracted, I presume, by the saltiness of the brackish waters.

Lake Rukwa I take to be much larger than has hitherto been believed, and extends much more to the south and east than is indicated by the dotted lines on our maps. It may be 80 or 100 miles in length, and 30 or 40 broad. The natives say that it would take many days to go round it in a canoe, but that they never do so, owing to their enemies. Its waters are dark in colour, very brackish, very muddy, and quite undrinkable. I was much amused when I saw the youth who brought me specimens of its waters go a distance of 300 yards before he could dip the bottle, and that he should then be knee-deep in mud. I would say the lake is merely the shrunken vestige of a much greater lake. Several trees were pointed out to me as having been a few years ago at the water's edge, but which would now be some miles from the water. Fish are numerous, but are not much sought after by the natives. I brought home several skeletons. I saw no hippopotami, nor crocodiles, nor canoes in its dark, uninviting waters. These may be present, however. The mud on its shores is really a form of lime, and was covered with a white crustaceous deposit of some white salt, and where the water was quite evaporated the mud was extensively cracked.

There had been no rain in that neighbourhood for two years, and, as I afterwards found, the Songwe river, which here enters the lake, seems to lose itself to a great extent in the sand as it approaches its mouth. We take it, therefore, that Lake Rukwa is rapidly evaporating, and that during an exceptionally wet season the level of the lake rises considerably. All the natives affirm that there is no outlet, and that, I think, cannot be doubted.

On nearer inspection I confirmed the observation from the hills that the lake is skirted on its east shore by a range, a high range, of mountains that rise as a jagged wall of several thousands of feet, in some places as sheer precipices from the water. There is no native path along the east shore. At the south-east corner there seems to be an inlet into the mountain forming a large bay, but I did not reach that point. The south and west is skirted by a plain not many feet above the level of the water, and covered with bare sandy patches, long grass, and thorny acacias. Certain parts of this seemed formed of red sand, through some of the beds of which streams had at one time cut their way, but the greater part seemed formed of beds of soft chalk. The Songwe river, for instance, runs for miles through such beds. This plain may be 30 or 40 miles in breadth, and it represents what was at one time the bed of the lake.

The west shore is inhabited by the Awafipa, the east by the Awakhonongo, while the south belongs to the Awaungu, under the chief Mwenewungu. As I had heard from the Arabs before leaving for this journey, and as was confirmed by the natives themselves, this country was formerly rich in elephants. Now, however, they have all migrated to the hill country to the east. The Awaungu still hunt extensively, and when I saw them were well armed and well clothed.

Buffalo are very plentiful, as are deer and wild pig. Every village has a heap of buffalo horns inside the gate, some of which were the largest and finest I have ever seen. No rain is said to have fallen for two years, and consequently they have no gardens, but live on the fruits of the chase—black and white ivory. On my return journey I came along the banks of the Songwe river towards the Momboyo Mountains east by south. This river, to my surprise, grew broader and deeper as I went towards its source, and presents a marked example of a river running through a sandy burning plain losing itself in its course. Its banks were well wooded, and presented quite a contrast to what it is at the village of Mwenewungu and to the country round the lake generally. At the village of Mireya, on the banks of the Songwe, I was much struck by the great beds of lime or chalk through which the Songwe runs. The banks of the river here as it went through these beds would be 80 or 100 feet in height, and the chalk was so soft that it crumbled under the hand. There are great fields of this soft chalky rock, having imbedded many specimens of small aquatic shells.

We have known of the existence of Lake Rukwa ever since Burton and Speke's day, but, as far as I am aware, the southern part has never been visited. Mr. Thomson saw it, in 1879, from the hills at the north, at a distance of 30 or 40 miles, and Dr. Kaiser was at its northern end in 1882. Since then it has not been seen by any intelligent visitor until Mr. Johnston and I saw it in November 1889. Its shores are the most uninviting we have perhaps ever seen, its country the poorest, its rainfall nil, and its temperature in the shade at noon stood about 98° F.

It becomes an interesting problem to account for the want of rain round this lake. The natives assured us that formerly there had been much rain, but that for two years no shower had watered their gardens. This seemed to be confirmed by facts. Remains of old gardens were there, with stubble in the fields. There were the dry beds of many streams, but no water. As we pushed on our way across the burning plain we saw in the hardened mud several deep hoof-marks of heavy game, as elephant or hippopotami, indicating the presence at one time of much moisture and soft mud. The people have not been cutting down the trees, or in any other way affecting their country. The hill country through which we traversed was remarkably well watered, and green, but this was a blighted spot in the midst of fertility.

A word now on the commercial geography of Nyassaland. So far as its surroundings go, this part of our newly acquired territory—for the west shore of Nyassaland, all except a little to the north, is British—is not unfavourably situated as regards moisture-laden winds and rains. That it is mainly terrace land and plateau, and the watershed of the continent, adds greatly to its possibilities. Its mountain ranges lay hold of the moisture-laden clouds and compel them to discharge on their rich slopes and bases. Its great rainfall testifies to this. On Kararamukas Plain the rainfall may be over 100 inches.

As regards temperature it is moderate. The average midday temperature in the hottest month—November—is 83° F., and the average night temperature of the coldest month—May—is about 30° F., a range of 53°. Occasionally we may have variations, but these are offered as approximate. The wet bulb thermometer stands at 10° below the dry bulb generally throughout the dry months of the year.

With these facts before us, the rainfall, the temperature, the high plateau character of the uplands, what are the results as to the productiveness of the soil and what the prospects of their being habitable for Europeans? I could give quite a list of native products. What grows in other parts of Africa grows here in abundance, including tobacco, the wild vine, dates, and pine-apples. Judging from the capabilities of the Shire highlands, which are not nearly so well watered as the lands I speak of, but where coffee flourishes and commands in the London market a first-class price, I have no hesitation in saying that

these uplands are abundantly capable of raising great crops of coffee, tea, cloves, cinnamon bark, and cereals of various kinds.

At the last meeting of the British Association, Captain Lugard, in speaking of the capabilities of Nyassaland generally, made a few suggestions, every one of which I endorse. In addition to the production of tea, coffee, cloves, cinnamon bark, wheat, linseed, flax, cotton, perhaps indigo and indiarubber, &c., there are indigenous products which might facilitate matters on the spot. There is a tree of the sycamore family which grows extensively all over the north of the lake—called *Mwisungute* by the natives—which might be developed. It is a most picturesque tree, which produces a food, an oil, and a dye. The oil, or fat, when cool is solid, even at a tolerably high temperature, and is like beeswax. It burns well as a night-light, and with wax might be made into candles. In a rude way I have made candles of it. It might also make an excellent soap.

Hides too might be utilised. Hitherto nothing has been done with these. Great herds of cattle are found everywhere on these uplands, the hides of which are only partially used by the natives for sheaths for knives, war shields, &c.

Oil seeds too are found in abundance. The country abounds in fibres, from that of the *borassus* palm and the banana palm to the soft down of the cotton tree.

All agree that if Africa is to progress at all it must be not so much by the development of her native animal and vegetable commodities as by the active culture of introduced products, or by the fostering of presently existing products. This can only be done by native labour. What, then, of it? The African has been called lazy. He is not so. Nature is kind to him, and his wants are few, and, there being no stimulus to his energy, he takes life easily. But all over Nyassaland, wherever work has been offered, there have been plenty of hands ready and willing. Of course you cannot expect too much from a people who hitherto have been idle.

There is going on at this moment on the Shire Highlands a most interesting experiment that will one day give an answer as to how far Africa is capable of being colonised by Europeans. At present there is quite a small colony living there. Perhaps there are 50 whites, all of whom enjoy good health, children are born and are growing up, and vigour is maintained. The secret is they are properly housed. They do not rough it, but secure all the comforts of home. I feel certain that if we were compelled to live in as poor houses in England as some of us have been treated to in Africa, and attended to our table as indifferently, we should have constant recurrences of illness, as we have in Africa. Every European should have a good house, and not a thatched one, and we venture to say that if he were so favoured in most places of Africa he would be blessed with good health. On the whole, the

climate of Nyassaland is good, its scenery picturesque and enchanting. Now has the time come for its development and civilisation. The west shore of Lake Nyassa has been given to us, all—unfortunately—except the fairest spot, that beautiful undulating plateau land of which I have said so much, north of the Songwe river. This spot has been allocated to Germany. Our mission in Africa must be twofold—to develop commerce and to promote civilisation. I am hopeful of Africa. With proper measures we may found in it to a small degree what we have established in India—a vast, prosperous, independent, and beneficent empire. The work on which we have entered has indeed a nobler side than that of mere colonial extension, let alone of trade and barter. It is a mission of deliverance of man from the rapacity and tyranny of unprincipled men, and of the extension to helpless and unenlightened millions of those great advantages which we believe to be attendant upon a humane and a Christian civilisation.

The Russian Expedition to Central Asia under Colonel Pevtsov.

Translated from the Russian by E. DELMAR MORGAN, F.R.G.S.

IN former numbers of the 'Proceedings' * we published translations of Lieut. Roborofsky's letters on the progress of this important expedition as far as Nia, at the northern foot of the Kuen Luen, and in August last we communicated more recent intelligence concerning its movements. We are now indebted to our Honorary Corresponding Member General Venukoff for a copy of a later letter from the same officer, of which the following is an abridged translation:—

KARA-SAI (foot of Russian Range),
9th July, 1890.

We left Nia on the 24th April (1890), having previously sent the Cossack Shestakof, the soldier Manukof, with an experienced guide, to the Cherchend river to form a dépôt there. They took with them 30 camels, needful for our homeward journey, and 20 bales of our baggage laden on oxen.

On the 2nd May we arrived at Kara-sai, at the foot of Russian Range. From this place two reconnaissances were sent to explore the nearest parts of Tibet: one, under the command of Kozlof, to the south-east and east; the other, under my direction, along the northern slope of Russian Range to the river Keria. Taking with me the Cossack Bainof and a guide, I started on the 7th May, and travelled upwards of 40 miles by a route already known to us from our exploring expedition of last autumn, when trying to find a pass into Tibet. We went by the valley of the Saryk-tuz, having on our left the Uzu-tagh, its summits now brushed with snow, and its rounded foot-hills sloping to the valley. On our right rose the wilder and more abrupt Astyn-tagh, rolling the debris of its cliffs and peaks into the bed of the valley. Here, as at Kara-sai, spring was in full progress. Clumps of willow,

* Vol. xii. 1890, pp. 19 and 161.

thorny caragana, scented wormwood, *Lasiagrostis*, *Reaumuria*, and *Sympegma* were already green. The soft loess hills were graced by many a blue Iris scattered here and there in the midst of *Festuca altaica* and *Stipa*. The northern slopes were speckled with the white flowers of *Androsace*, never met with below 10,000 feet of elevation, and ranging as high as 14,000 feet. On the banks of the rivulet and in the hollows of the hills, besides the dirisun grass and *Clematis orientalis*, sheltered in the clumps of *Myricaria germanica*, grew the Kashgarian barberry (*Berberis kashgarica*), its unopened golden buds twined round the branches with their small pointed leaves. Among the rocks two or three kinds of *Oxytropis* might be observed, not yet in flower.

Among animals we found only wild goat (*C. pseudo-Nahoor*) coming down to the river in herds to drink, and a species of *Bobax*, darting quickly into their burrows and uttering their shrill but not discordant note. Of the feathered tribe we also found but few representatives, for the hen-birds were sitting on their eggs and their mates keeping watch beside them, so that we saw only one or two stray rock pigeons, the restless and noisy thrush, its gay pink feathers glistening in the sun, and a few flocks of mountain finch. In the morning we heard the prolonged whistle of the ullars and the cluck of the rock partridge.

On the third day I went on to Kan-bulak, a gold placer much frequented by the natives not only for the sake of its gold, but as a welcome retreat from the Chinese, who never go there, it is said, because they are afraid of passing the shrine of Mandjilik-Khanum, which lies near the road. We found nobody at the workings, but met five men returning to Keriä, starved out with cold and hunger; they said the lateness of this year's spring, storms and snow, had put a stop to all work, their asses had perished for want of food, and they themselves were now making their way home on foot as best they might. The gold is washed with melted glacier water from Astyn-tagh (Russian Range). The miners erect stone shelter-huts along the precipitous bank of the river, roofing these with felt; these huts are, however, a poor protection against the constant inclemency of the weather. We, too, experienced snowstorms at Kan-bulak, and saw no signs of spring; snow was lying for eight miles along the Saryk-tuz, the absolute elevation being 14,000 feet, and the thermometer falling to - 10° Cent. on the morning of the 10th May.

At Kan-bulak the Uzu-tagh alter their appearance, for though continuing in a south-westerly direction they are much lower and their foot-hills less developed. At the foot of the north-western slope the Siu-bulak spring, the source of the Saryk-tuz, takes its course. On the south-west side of these hills lies Lake Khonghit-kul, possibly fed by springs and by the snow-water of Russian Range. We only saw a few widgeon here. Twelve miles to the west of Akka-tagh, Russian Range rises in another lofty group of snowy peaks to a height of 20,000 ft. above the sea, connected by a ridge of rounded clay hills with Uzu-tagh, this latter hardly deserving here the name of a range; it is rather a flat-topped ridge, subdivided on the west into several ridges, soon sinking in the plain.

Our bivouac was at Saryk-tuznyn-ata, north of the highland. Here my guide and the Cossack fell ill, but recovered after I had treated them with quinine. The horse of the latter also sickened and had to be left behind, and we began to fear the other horses might also knock up; they shivered as though they had ague. On the morning of the 11th we made for a pass over some low hills, ascending gradually through red sandstone cliffs to the summit, whence we had a distant view to the west over a row of heights, the snowy crest of the Kerian range beyond the river of that name appearing as though swathed in clouds. On our right were the gigantic snowy peaks of Russian Range, fading away in the misty distance.

In the furthestmost group of these peaks rises the huge mountain named by

Prejevalsky "Tsar-Liberator." On the south, Russian Range breaks off abruptly with a wall-like steepness, and without any foot-hills, to the barren valley of the Shor-kul lake. We descended from the pass, which has nearly 17,000 feet of elevation, to this valley, by a very gradual and delightfully easy slope. We found it composed of soft sand, mixed with pebbles, but devoid of all vegetation. Having marched 26 miles to the lake, we bivouacked by the side of a freshwater spring. Shor-kul is about five miles long by three broad, with its longer axis protracted from east to west. Its water is brackish, the shores are flat, marshy, and covered with a thick crust of some kind of salts. The southern shore, however, is steep, for here a spur of the Uzu-tagh runs down to it before extending in the direction of the Kerian river. The western shore of the lake (14,000 feet) is much wider and covered with vegetation. Here we saw several hundred Orongo antelope grazing. In order to lighten our tired horses for their great march to the Kerian river, we left all the things here except what was indispensable, and on the 12th set out, with some misgivings as to a safe return. For 12 miles we kept along the Shor-kul valley, then turned sharply to the south, and afterwards to the south-west, entering the mountains by a defile of red sandstone, and gradually ascending to the pass. Having gained it, we again saw the gigantic snowy mountains beyond the Keria. The day was already far spent when we hastened after our weary steeds.

At length we beheld the river; but, greatly to our astonishment, it was dry. The frost had turned its sources into ice. The guide was in despair. I bade him and the Cossack search for fuel, while I with tea-kettle and axe descended the bed of the river to look for water. Great was my joy when I came upon an excellent spring about a mile lower down. But fuel was so scarce that it was ten o'clock at night before we had some hot tea. The night was cold and clear as we lay down to sleep after giving our horses their corn. Early in the morning, taking advantage of the fine weather, I took a number of sights, and plotted the environs of the river on the map. To the west, at some distance from the river, and nearer the great mountains, stands a lofty but not a snowy range; it extends from north-west to south-east, and is divided by the river, which has a general course from south-east to north-west, its wide stony bed indicating a great volume of water in summer.

We were obliged to hasten our departure from this barren, waterless river-bed, as we feared for our horses, which showed signs of exhaustion. Having finished the observations necessary for the map, we started on our return journey. Another long day's march brought us to Shor-kul by the evening. Here we found everything as we had left it, and gave our horses a feed of barley.

Our return march was in every respect satisfactory, except that we had to face storms of wind and snow which hindered our advance and impeded respiration. On the 15th May we were back at Kan-bulak, whither, according to my instructions, a supply of corn had been sent for us. Here I succeeded in taking observations for latitude and longitude before the sky clouded over and a snowstorm began.

On the 18th May I was once more at Kara-sai, having in twelve days marched 134 miles to the Keria river, and 134 miles back, 268 miles in all, and plotted my route on the scale of 10 versts to the inch. No collections, except plants and a few minerals, were made. It would have been impossible for a caravan to have gone that way owing to the great elevation and want of food.

Kozlof's reconnaissance also proved there was no route available for a camel caravan in that direction, owing to the difficult and broken nature of the country and the scarcity of fodder in the more distant marches.

It was accordingly decided to send two exploring parties to the Tibetan plateau and a third along a range of mountains to the east. Bogdanovitch undertook this last reconnaissance, Kozlof that into Tibet in an easterly direction, while I went

south. As the region I was about to enter was not only uninhabited but had never before been visited, and as nobody knew anything about it, I considered it unnecessary to take more than one man with me, my orderly, Sergeant Bezsonof. We started together with one pack-horse besides the two we bestrode.

For the first 60 miles, as far as Siu-bulak (the source of the Saryk-tuz) the ground was familiar. At Siu-bulak springs force their way to the surface and form a good-sized brook fed by the snows of Akka-tagh. It lies at an elevation of 14,500 feet; the only plant is a species of *Eurotia*, serving both for fuel and forage for the horses. Here we formed our depôt, leaving all spare things and enough provisions for our return journey, and taking with us only what was absolutely necessary for a five days' march. In this way we were able to lighten materially our horses' burdens. On the morning of the 31st we began the ascent of Uzu-tagh. The slopes were easy of ascent, the summit of the col flat and wide, with outcrops of schistose rocks continuing the whole way down the southern side of the mountain. The height is about 17,000 feet. On the south-west the snowy Kerian mountains were visible in the distance, and nearer our point of view a mass of slaty, weather-worn heights and ridges stretching to the east and north-east: from their midst rose an isolated range with three sharp peaks covered with snow. Due south stood a solitary, very high mountain, its summit wrapped in clouds and a snowstorm lashing its foot; in the foreground were other schistose, weatherworn ridges, connected with Uzu-tagh by a valley five miles long. Some of the higher ridges on the south-east continue a long way to the west as far as the river Keria. On the east and north-east they all fall away to the level of the plain. About 40 miles south-east from Uzu-tagh a lofty, steep spur detaches itself, covered, as far as we could judge, with freshly fallen snow.

Our direction was a little east of south, the north-east gale blowing behind us. Having gone 21 miles, and seeing the first little bushes of white willow, we halted for the night. The road we had come was exceedingly fatiguing for the horses, the elevation often exceeding 16,000 feet, and the soil being almost always composed of schistose strata tilted on edge. The ridges before us were even higher and of the same character, having all a north-easterly direction. The strata bore evidence of much distortion, lying either edgewise or completely turned over with a general strike from the north-west. There were no signs whatever of human habitation, neither did we see any animals except a few antelope in an exhausted, starved condition running towards the north, and so tired that they passed within fifty paces without noticing us. This gave us grounds for inferring that these animals had come a long way, and that the country to the south was equally barren and inhospitable. We also observed the skulls of a few yak, but saw none of their tracks. Probably these animals had also entered the country and perished. Our horses were in wretched condition, the driving snow affecting them more than anything. Though covered with felt they trembled like aspens. I had never before been in so wild and lonesome a desert, and felt that, carried away by my curiosity, I had ventured further than prudence would have dictated.

Nevertheless, the next day we continued to advance, crossing, after a few miles, the bed of a river flowing towards the Keria. It had very little water, and this only in places; but judging from the width of its channel, there must be a time when it becomes a raging torrent. The valley of this river has an elevation of 16,000 feet; there were a few little bushes of white willow half concealed below the soil. We now ascended to the watershed, finding it not much below 17,000 feet. Henceforward the drainage was to the south over the Tibetan plateau, and we soon came to a river flowing from west to east, and then south-east, at an elevation of 16,000 feet. Beyond it rose another of the slaty ridges, which we ascended and,

from its summit had a splendid view of the mountains, folding the Kerian river in their stony embrace, and stretching away to the south-east, and then suddenly falling away to the east, where they are interrupted by a wide plain, and break up into a number of small schistose ridges, continuing to the horizon. We could see for 20 miles to the south of us, as far as a distant ridge, the intervening expanse being filled with bare weatherworn heights and serrated ridges, all of one character. It was a monotonous, dreary landscape, devoid of human beings and animal life of any kind, with those everlasting dark, slaty ridges, worn by time and weather, all in one direction. The region is rainless, for there are no water-channels here, and the heights of the mountains are scored by the winds, not by aqueous agencies. The atmosphere is excessively dry, judging from the total absence of moss on the soil and rocks. Snow falls daily, but is swept away by the winds, and evaporated by the dryness of the air. Wherever drifts collect and thaw in the sun the ground is damp. We came upon no springs, lakes, or other natural reservoirs. The winds from the north-west and north-east blow with terrific force, mostly from 11 to 12 o'clock in the day, and at 8 in the evening—sometimes at night when the frost exceeds -10° Centigrade.

We descended to bivouac, having marched 29 miles that day; having collected enough willow fuel to make a fire—we had brought our supply of water—we drank tea, and lay down to sleep, intending to begin our return journey on the morrow. It was indeed time to retrace our steps if we hoped to save our horses. The height of our bivouac was ascertained by boiling water to be 16,500 feet. In the morning our steeds looked very ill, though they had had enough to eat. At the eighth mile the one Bezsonof rode refused to go any further; hoping it might be only a temporary weakness, we halted and waited, but the animal became worse and died in an hour. We then continued our journey, Bezsonof being obliged to go on foot. The weather was fortunately better, and after marching 20 miles we halted by the side of a brook flowing towards the Keria; here we bivouacked. But great was our astonishment the following morning to find our pack-horse dead; mine was still alive, but it refused its corn. We were only two in this weird, death-like solitude, where probably no human being had ever set foot before. A long march lay before us, and on foot it is impossible to go far or long at these altitudes. We decided on throwing everything away, merely retaining our warm clothing, which we fastened on our one remaining horse, in order to have some protection against the cold at night, and our kettle to make us some tea; this and a little barley meal being our only nourishment. No other warm food of any kind passed our lips for four days. Shouldering our rifles we started on foot at 6.45 a.m. The difficulty of marching at these high elevations was increased by the sharp rocks over which we had to make our way, and the keen winds. The dreary aspect of nature too oppresses the soul. Our horse fell lame owing to the rocky ground; it lay down every half hour, and could hardly be forced to get up. In this way we advanced the whole of one day. It was with great difficulty we surmounted Uzu-tagb. Here, however, the nearness of our cache of provisions and the hope of reaching it infused new energies into our bodies; we actually ceased to feel tired and starved; even the horse seemed to take fresh courage and went better. But twilight overtook us half-way down the mountain, and stumbling along in the dark we only reached our cache at 10 p.m., having taken $15\frac{1}{2}$ hours to come 10 miles.

Our joy was great, and we soon forgot our fatigues as we caressed the good horse that had borne our warm clothing and been the saving of us. Cheerily that night we sat over our willow fire, a sufficient supply of this fuel having been left over from our last bivouac at this spot. Bringing forth our supplies from the hiding-place, we consumed them with the avidity of Pharaoh's lean kine. After the horse

had rested awhile we gave it corn, but it would not eat; we would have led it to the water, but it would not move its aching legs. We brought it water in our kettle and gave it to drink, and it was one o'clock before we lay down to rest, the night being warm and unusually starlit. . . . My waking slumbers were disturbed by the cries of widgeon flying to their feeding-grounds. When the sun woke me with its scorching rays, Bezsonof was still asleep, and the horse stood where we had left it at night. Its legs were still excessively stiff and tender, and it could not move them. I woke my companion, and we decided to cook our dinner and make a good meal before starting in the afternoon to march the 13 miles that remained to Kan-bulak. By half-past one we were quite ready to start, and were about to load the horse, when we perceived it could not move. We placed before it two days' rations of barley, and leaving everything behind except our guns, at 2 p.m. set out for Kan-bulak.

The march of the previous evening had left its effects upon us. Our limbs ached dreadfully and our heels were sore from walking over the sharp rock. But we went steadily forward, occasionally stopping to get breath, for the wind was right in our teeth. Half-way to the spring we saw antelope, probably the same we had met beyond the Uzu-tagh. But they had had time to rest, and would not let us come within range. We arrived at Kan-bulak about 6 p.m., and received a cordial welcome from the owner of one of the placers, the miners evincing great interest in us, and asking us a number of questions. At daybreak the following morning I despatched a letter to Colonel Pevtsof, informing him of my necessitous position, and begging that horses might be sent. Four of the miners volunteered to fetch our things left behind at Siu-bulak, and returned with them late that evening. But nobody would consent to go for those we had abandoned on the other side of Uzu-tagh, though I offered good pay; they all feared the great elevation and want of inhabitants, and declared that that country killed every living creature. From the 4th to the 8th June we were obliged to remain at Kan-bulak, the weather all the time being execrable. Daily storms of wind and snow prevented the miners from working, and compelled them to seek the shelter of their wretched shanties. On the 7th June the Cossack Bainof and Osman Khaisi (my guide to the river Keria) arrived, bringing us horses, and we lost no time in starting on our journey. I proposed to Osman that he should fetch the things left behind; at first he would not consent to go alone, but having found a companion in one of the boldest of the miners, he promised to bring them.

We were impatient to return home, and on the 10th arrived at Kara-sai where our companions were expecting us, and where we gave a full account of our adventures. Kozlof and Bogdanovitch had also returned; the former having gone 100 miles and seen a country very similar to that visited by me, and as impracticable for camels. Bogdanovitch had gone along the southern slope of the mountains to the Kona Pass. This, too, is very difficult on the northern side and unsuitable for camels. I had advanced 120 miles altogether, 46 miles south of Uzu-tagh, whence I had seen 20 to 30 miles further, that is to say, about 70 miles in all, and had ascertained that the country was impassable for beasts of burden. The enormous altitude and constant storms which had cost me two horses; the absolute want of fodder, and the rocky surface injuring even shod horses, render a passage in this direction impracticable. This country, it may therefore be assumed, will long remain unexplored by Europeans.

Taking into consideration all the information obtained by these reconnaissances and the complete impossibility for a caravan to advance in this part of Tibet, Colonel Pevtsof determined to try one more scouting expedition under his own leadership, in order to acquaint himself personally with this wild inaccessible country, and after-

wards to move the caravan by the road at the foot of the mountains to Achan and the Cherchend river to join Shestakof's depôt. Thence we shall march for Prejevalsky range by the route explored by me in spring, and dividing into two parties, explore this range and the country round it.

VSEVOLOD ROBOROVSKY.

GEOGRAPHICAL NOTES.

Mr. Theodore Bent's Expedition to Zimbabwe.—Mr. Bent left England last Friday (January 30th) on his mission to explore the strange ruined buildings in the gold region of South-east Africa. An unfortunate error in our note on this expedition in the January No. of the 'Proceedings' escaped correction in proof. It is the Chartered South African Company (not the East African) which has interested itself in Mr. Bent's archaeological and topographical exploration. This company and our Society have each contributed a grant of 200*l.* towards the expenses of the expedition.

The Zimbabwe and other Ruins in Mashona-land.—We have received from Mr. E. A. Maund the following information regarding these famous ruins, which he has obtained from Mr. Phillips, in correction and amplification of the remarks made by him at the meeting of the Society on the 24th November last: *—Mr. Phillips was all over that part of the country in 1866, and was with Mr. Hartley the year after, and saw many old gold diggings near the hill which then first got its name of Hartley Hill. In 1868 he and Mr. Westbeach crossed the Hanyani and went down the Mazoe. In October 1871 he was hunting at the junction of the Ingwesi and Lundi rivers, when a letter was brought to him from Herr Mauch. It was not signed, but the writer reminded him of an adventure they had had together with five lions on the Mahalapsi, so that he might identify him. Mauch said he was living with a man named Renders (not Kinders), and was in a bad plight, having been robbed of everything except his papers and gun. He begged him not to bring a Matabele with him, as they were living among the Mashonas. Phillips went and found Mauch and Adam Renders, an American, living on the top of a kopje, a few miles south-west of the ruins of Zimbabwe. It was a pretty place; a waterfall coming down from the ridges above fell into a pan by the hut, in which it disappeared, to come out again in a gushing fountain several hundred feet below—a cave of refuge being close by, with water flowing through it, to which they and their Mashona hosts could fly and barricade themselves in with a boulder of rock when Matabele raiding parties were afoot. Mauch told him of some ruins in the neighbourhood, and next day the party went to see them. It was really Renders who first discovered these ruins, three years before Mauch saw

* 'Proceedings R.G.S.,' *ante*, p. 20.

them, though Mauch and Baines first published them to the world, and they only described what the old Portuguese writers quoted by Mr. Maund talked of hundreds of years ago. Mauch, on their arrival at the Zimbabwe ruins, asked what they thought of them. He (Phillips) confessed he was not greatly impressed, as they were exactly like several others he had seen in other parts of the country. There were the same zigzag patterns, and the mortarless walls of small hewn stones. Shortly before, when hunting in the mountains to the west of Zimbabwe, he had come upon a regular line of such ruins, one of which must have been a very large place. It had three distinct gateways in the outer wall, which were at least 30 feet thick at the base, and an immense ironwood tree, that would have taken hundreds of years to grow, had grown through a crevice in the wall and rent it asunder. On the side of a gateway were vast heaps of ashes with occasional potsherds about, the only evidence of the old inhabitants. He had found the same kind of ruins all over the country, very frequently on the summit of difficult kopjes. Those at Tati and Impakwe are good examples; but the most perfect perhaps of all lies north-west of Tati. The tower there is about 60 feet in length and breadth, and 80 feet high, the walls about 15 feet thick, and it is entered by a passage winding spirally to the top, which is so arranged as to be commanded by archers from the interior all the way, and is so narrow that it admits of the passage of one person only at a time.

French Explorations in Madagascar.—A series of explorations of great interest have, during the past two years, been carried out by two French travellers, MM. Catat and Maistre, in little-known regions of the island of Madagascar. The results accomplished by these travellers were described by M. Grandidier, the well-known authority on Madagascar, at a recent meeting of the Geographical Society of Paris. In the summer of 1889, the "Radama I." route from the capital to Tamatave was explored, with the result that it was found to be not so short or so practicable as the ordinary route. The travellers discovered a marshy zone called Didy, similar to the great lacustrine plain of Antsihanaka, lying between the central mountains and the coast range. Two days were occupied in crossing this hitherto unknown marsh, which gives rise to the river Ivondrona, one of the principal streams of the eastern part of the island. The travellers then proceeded to the bay of Antongil, with the intention of crossing the island along the 16th parallel, but M. Maistre was attacked by fever, and returned to Antananarivo, not, however, by the usual route, but through the province of Antsihanaka, which he found to be placed too far eastwards on recent maps. M. Catat, meanwhile, crossed the island from the east, and reached the west coast at Majonga. He found that the great central mountain mass does not extend, as hitherto supposed, to the 16th parallel; and that the great plains of secondary formation, with their characteristic vegetation of twisted and stunted Bourbon palms and other special trees, occupy here

more than two-thirds of the country. The elevated zones of the eastern slope of the coast range are covered with forests, which belong to the first belt of forests running through the whole length of the island, but M. Catat found no trace in this region of the second belt, parallel to the first, which clothes the slopes of the central mountains between Ikongo and Antsihanaka. M. Catat returned from Majonga to the capital, up the valley of the Ikopa. The two explorers subsequently visited together the south of the island, where they discovered the sources of the Omlahy, which discharges itself into the Bay of St. Augustine, also those of the rivers Manambovo and Mandrary, and of one of the head streams of the Mananara, and were thus able to determine the watershed of the principal streams of this southern region. They returned from Fort Dauphin along the south-east coast to the mouth of the Mananara, which they ascended as far as Ivohibé, and surveyed the hitherto unknown course of this important river. Their collections will, it is stated, prove to be of much interest to anthropologists and naturalists.

Lady Burton.—A proposal, originating in the Council of the Royal Geographical Society, to memorialise the Prime Minister in favour of a pension being granted to the widow of Sir Richard Burton, was carried out during the latter part of December, and we are glad to announce that the application has been successful. The memorial was supported, as will be seen, by the four Societies with which the great traveller and linguist was more especially connected. It was worded as follows:—

6th January, 1891.

As representatives of the Societies with which the late Sir Richard F. Burton, K.C.M.G., Her Majesty's Consul at Trieste, was more immediately connected, we have the honour of calling your Lordship's attention to the case of his widow, Lady Burton, left, as we are informed, in straitened circumstances, and to express a hope that a pension may be granted to her in consideration of her husband's services to science and literature.

To Sir Richard Burton belongs the great merit of having been the pioneer in the exploration of the eastern portion of Central Africa. He originated and commanded the expedition which left Zanzibar in 1857, and resulted in the discovery of the two great lakes, Tanganyika and Victoria Nyanza. This expedition, towards the cost of which Her Majesty's Government made a grant of 1000*l.*, and which showed the way to the sources of the Nile and the upper waters of the Congo, since followed up by other travellers with important results, will take rank among the greatest deeds in the history of African discovery, and the merit of its originator and leader is enhanced by the elaborate report presented by him to the Royal Geographical Society, on the countries traversed by the expedition, their inhabitants and products, a perfect mine of information, the value of which has been acknowledged by subsequent travellers.

Besides this great and chief undertaking, Sir Richard Burton distinguished himself by his adventurous travels in many other lands. The most important of these were his journey to Mecca in 1853, his two attempts to penetrate to the interior of Somali-land in 1854 and 1855, his journey to the hill-region of Usambara in East Africa in 1857, his various separate expeditions into the interior of the coast lands of West Africa, to Abeokuta and to the summit of Mount Cameroons in 1861, to

the Yellala Falls of the Congo, his visit to Dahomey in 1863, his long journeys in the interior of South America in 1868, his explorations in Syria in 1869, and in Midian in 1876-8. Of all these he published instructive narratives, abounding in information regarding the geography, ethnology, and commercial resources of the various countries to which they relate.

Over and above his great and varied work as a traveller and explorer, Sir Richard Burton was eminent as an expositor of Oriental literature, and his extraordinary accomplishments as a vernacular linguist gave an additional and peculiar value to the numerous translations, with copious notes, which he published in the course of his busy life either as independent works or as contributions to the series of the Hakluyt Society or the 'Journal' and 'Proceedings' of the Royal Geographical Society.

M. E. GRANT DUFF,
President, R.G.S.

NORTHBROOK,
President, R. Asiatic Society.

JOHN BEDDOE, M.D.,
President, Anthropological Institute.

F. A. ABEL,
*President, British Association for the
Advancement of Science.*

The Most Hon. the Marquis of Salisbury, K.G.

On the 22nd January our President received the following answer from the Treasury:—

Sir,—In reply to the letter of the 6th inst., signed by you and others, I am desired by Mr. W. H. Smith to say that he has much pleasure in informing you, and through you the various Societies interested, that the Queen has been pleased graciously to approve of his recommendation that a Civil List Pension of 150*l.* be awarded to Lady Burton, widow of the late Sir R. Burton, K.C.M.G. The necessary directions have been given accordingly.—I remain, &c., C. J. MAUDE.

The Right Hon. Sir M. E. Grant Duff, G.C.S.I.,
President of the Royal Geographical Society.

Mount Everest.*—Through the courtesy of Dr. Emil Schlagintweit, a printed memorandum, forwarded to him from the Surveyor-General's office in Calcutta in June last, and entitled "A few lines on Mount Everest, a reply to Dr. Schlagintweit's note in Petermann's 'Mitteilungen,' vol. xxxiv., 1888, by Colonel H. C. B. Tanner, accompanied with three panoramic profiles of the East Nepal group," has been communicated to the Society. The more important of these profiles, that from Sandakphu, is practically identical with the view published in March 1886 in these 'Proceedings,' both being, in fact, reproductions from a sketch by Colonel Tanner, who now writes, "Without being a rigorously *true* profile based on angular measurements, it may be considered a fairly accurate one." This modest estimate is more than borne out by comparison with photographs of the same view from nature, which I have received from Mr. Paul, the Deputy Commissioner at Darjeeling. The two other outlines are more distant views of the same group from the plains, at a distance of 115 and 127 miles respectively from its highest peak. Colonel Tanner

* By Mr. Douglas W. Freshfield.

is now able to bring forward valuable evidence on a point which, in 1886, I ventured to suggest ought to be referred to a competent observer on the spot, the identity of the peak pointed out to Hermann Schlagintweit and Dr. Hodgson in Nepal as Gaurisankar with the Mount Everest of the Survey. I quote his report:—"I now have before me the panoramic profiles and angular measurements of Major Wilson, for some time resident in Nepal, who observed from Sheopuri, a point on the Kaulia ridge. Schlagintweit's Gaurisankar—the Everest of successive residents in Nepal—was pointed out to Major Wilson, and from his angular measurements I am enabled to identify that peak as No. XX., 23,447 feet, more than a mile lower than Everest, and in point of distance very far short of it. Thus it is certain that the 'Gaurisankar' of Schlagintweit, and of the well-informed 'pundits,' and of Jung Bahadur, is *not* the 'Everest' of the Survey Department, but some other mountain with which I am not for the present concerned. . . . That such high sounding names as Deo-dhunga, Gaurisankar, and Bharab-Langur are not permissible to the peak which we call Everest, is a matter of some regret; but they can still be applied to the general mass of mountains of which Everest is merely the most lofty pinnacle. . . . I for one should be glad to learn from a reliable source any native name for Mount Everest, but as far as my enquiries go—enquiries made during a number of years when conducting survey operations in Sikkim, or in the plains of Bengal immediately at the foot of Everest—I never met a native, either of Nepal or of the adjacent tracts, who could identify it as being higher than its neighbours, or as having any name by which to distinguish it from the surrounding peaks." Colonel Tanner does not here refer to the mention by Chandra Das, one of the pundits employed by the Survey, in his official report on his journey to Lhasa, of "Lapchhyikang, called Mount Everest in English maps."* He, perhaps, holds that

* 'Narrative of a Journey to Lhasa in 1881-2,' Surveyor-General's Office, Calcutta, 1885:—Page 5:—"Ronshar is a country of defiles through which the Dudkosi flows. It lies between the great mountain range running from north to south, of which the culminating point is Lapchhyikang (called Mount Everest in English maps), and that lofty range which commences east of Nanam (or Nilam) to terminate at the junction of the Sun and Dudkosi rivers. The Tibetan extension of Lapchhyikang westward along 28° N. lat., which forms the southern snowy wall of great Tibet, south of the Tengri district of Tibet, is its northern boundary. Shar Khambu, of which the loftiest peak is Chomo-Kankar of the Lapchi range, lies to the west of Arun, and south of the Pheruk district of Tibet."

Page 17:—"To our north-west, at a great distance, I saw numerous snowy ranges, said to be the Shar Khambu mountains, whose tops were wrapped in clouds. I got out my field-glass from my bag and feasted my eyes on the splendid scenery of the grandest and loftiest of the world's mountains—Choma Kankar (the lord of snows), which overhangs Lap-chyi, the famous mountain of great Buddhist sanctity. The highest of the three peaks that were visible, Choma Kankar, reposing in calm majesty in the shape of a rounded dome, rose high above all, and the two others that stood side by side, like his ministers, resembled blunted cones. They were resplendent with the rays of the sun, the shadows being cast to the north-west. To the north-west of these were the

in this case also the pundit applies the name to a peak other than the surveyors' "Mount Everest," or to a group and not to a particular peak. Bharab-Langur is, apparently, one of the names of the pass by which the road from Lhasa to Khatmandu by the Tengri-Maidan crosses the East Nepal chain. I have a photograph from a rude Tibetan map, which Mr. Paul believes to represent the pass in question. The various towns and monasteries on the road, the shepherds' stations on the hills, are all shown in a pictorial style; pilgrims march up the passes waving rosaries or prayer-wheels. In the centre of the map-picture, between two passes described as the La-skyid-gangsa-la and the Pirtsi-sa,* rises a group of five great snow-peaks: the central peak has its summit fashioned into a human head, with appendent clouds which form long dark mustachios; the two peaks next it have animal heads. This curious document, and also the narrative of Chandra Das (shortly to be published by the Society in a condensed form), show a considerable talent in the Tibetans for individualising mountain peaks. The pundit, indeed, displays an altogether surprising enthusiasm for mountain scenery.—In conclusion, I cannot agree with Colonel Tanner, that the discussion as to the best name for the 29,000 feet peak has been a waste of time. My argument has been based, not, as Colonel Tanner suggests, on the identity of Gaurisankar and "Mount Everest" (see R.G.S. 'Proceedings,' vol. viii. p. 183), but on the belief that some native name could be found for the group of which the latter peak forms part or for one of the passes near it, and that such a name might be properly assigned to the peak itself. His argument, on the contrary, has rested on a refusal to recognise, in this particular instance alone, the fact that in geographical nomenclature it is a common practice to transfer a collective name first given to a group to its highest peak, or to call a peak after the pass nearest it. For example, in his own report (1883-4, reprinted 'Alpine Journal,' vol. xii. p. 340) Colonel Tanner has written, "With the exception of a tract to the north-west of the summit of

Shar Khambu mountains, which gradually enveloped with ascending fogs, soon vanished from our sight."

From these descriptive passages there is certainly some reason to infer that the pundit's Chomo- or Chomakankar is Makalu, and that the whole group is known to him as Lapchhyikang. I should have believed that it was to these passages that Colonel Tanner has referred elsewhere (see Report, 1883-4), but that the position he there assigns to the "rounded top" mentioned by "S. O. D." is inconsistent with the geographical details given above, and that he could hardly have failed to notice the close correspondence of the pundit's description with his own Sandakphu sketch.

* The names have been transliterated for me at the British Museum. They run as follows, from top to bottom, along the two roads right and left of the map:—*Right*—Mya-li-pan-rgyas-ling; La-skyid-gang-sa-la; Cu-len; Sridt-kur-mi; Gron-kang; Sing-skyid-la; La-skyid-bduddul-pug; Kyung-pug; Peyi-mar-prug; Mood-rten-stupe; Cos-dge-pel-gling; Lung-ston-pug; Gyn-lo-bkod. *Left*—Zar-kang-bla-brong; Dingri-glang-skoi; Pip-tai-sa; Grong-kang; Rta-gam; Nam-cen-pug; Kar-po-bum-ri; Tsering-wa-gangs; Cu-bar-sgrn-pa-gling; Drin-stod-grong-pa; Krub-bde-rjod; Sag-kra. |

Kinchinjanga, we now have a map of the whole of that great mass of mountain peaks and ridges which *collectively go by that name*." If we can for the future confirm the common practice here recognised, and keep down exotic names, the discussion has served its main purpose, and I for one shall be quite ready to admit an occasional exception. It is far more important and interesting to improve our knowledge of the great ranges of the world than to name particular summits. There seems some reason to hope that the frontiers of India may before long be more fully explored, and the results of that exploration less sedulously concealed than heretofore. Meantime the Society's Map Curator would welcome copies of the maps of Kinchinjanga and Nepal referred to by Colonel Tanner, as well as photographic reproductions of his numerous drawings of Himalayan scenery, a few of which have been exhibited in England. And it would be interesting to mountain-lovers to have the original reports of the native explorers H. H. and G. S. S. of their journeys in East Nepal in 1871-2 and 1881-2, very brief references to which only have appeared in the Annual Reports of the Survey, but which, from the 'Sketch-map of the Routes traversed by Survey Explorers from 1865 to 1883,' appear to have led them very close to "Mount Everest."

Longitude Observations in Siam.—Our associate, Mr. James M'Carthy, Superintendent of Surveys in Siam, who read an instructive paper on that country to the Society in November 1887, and has lately been engaged in fixing the longitude of various places in Siam by the electric telegraph, has sent us a copy of the tables of the observations. The principal points thus determined are:—Luang Prabang (Phratat Choman Pagoda), long. $102^{\circ} 05' 56''$ E., and Korat (Court House), $102^{\circ} 06' 52''$ E.; lat. $14^{\circ} 58' 43''$. Luang Prabang has been determined from the observations of four different years, the results being sufficiently accordant. Using these and other values of longitude, Mr. M'Carthy has connected, chiefly by chronometers, upwards of four hundred points in different parts of Siam.

The Jebel Jurjura from Algiers.*—In the spring of 1886 I made the first ascent by a traveller, of which (so far as I can find) there is any record, of the second summit of the Jebel Jurjura, Ras Timedoune. On my return to Algiers I recognised the mountain, and tried in vain to convince some of the oldest residents that it was this peak and not the better-known Lella Kredija, of which the snows are seen glittering on the horizon from the gardens of the capital. The publication of the new official map of the country† now enables me to prove the correctness of my belief. The two summits are respectively 7572 and 7562 feet in height, and 68 and 63 miles distant from Algiers. A straight

* By Mr. D. W. Freshfield.

† 'Carte topographique de l'Algérie au 50,000,' published by the Service Géographique de l'Armée, Paris.

line drawn on the map from the higher and more distant Lella Kredija to Algiers, passes through Ras Timedouine. The inference is obvious and certain, that Lella Kredija is invisible from Algiers and its immediate vicinity.

Danish Explorations in Greenland Last Summer.—Two Danish expeditions were at work last summer in Greenland, one in the north, the other in the south. The former was composed of M. Lundbeck, entomologist; M. Hartz, botanist; and Dr. Bergendal, zoologist. The party arrived at Holstenborg on the 15th June, and proceeded thence by boat northwards. After thoroughly exploring the coast round Disko Bay, they returned, and reached Copenhagen at the end of September. The second expedition was carried out by Lieutenant Bloch and M. H. Lassen. Their objective was a stretch of coast between 61° and 62° N. lat., which had hitherto not been clearly outlined on the map. The summer in South Greenland was very unfavourable, but the objects of the expedition were nevertheless attained, and in addition some interesting observations were made on the edge of the inland ice.

A New Expedition to West Greenland.—It is announced in Petermann's 'Mitteilungen' that Dr. E. v. Drygalski, in company with M. O. Baschin, will visit West Greenland in the course of next summer, where they will explore the great ice-stream of Umanak Fjord, and study the glacier and inland ice. The expedition will be supported out of the Carl Ritter Bequest at Berlin.

The United States Census.—The definite results of the census of the United States taken in June last are now available. The following table shows the changes which have taken place in the population of the five great geographical groups into which the States are divided:—

	1870.	1880.	1890.
North Atlantic Division	12,298,730	14,507,407	17,401,545
South " " " " "	3,853,610	7,597,197	8,857,920
North Central " " " "	12,981,111	17,364,111	22,362,279
South " " " " "	6,434,410	8,919,371	10,972,893
Western " " " " "	990,510	1,767,697	3,027,613
Total United States	38,558,371	50,155,783	62,622,250

In these figures Alaska and the Indian territories are not included, so that it is calculated that the total population of the United States at the date of the census was 63 millions, showing an increase of nearly 13 millions in ten years. It is of interest to trace some of the influences which have been at work to bring about the variations in the above groups, some of these influences being distinctly geographical. To take one instance from the North Central group: during the past ten years the population of Dakota (north and south Dakota combined) has

increased from 135,177 to 511,527, or 278 per cent.; Nebraska from 452,402 to 1,058,910, or 134 per cent.; and Kansas from 994,096 to 1,427,096, or 43 per cent. This increase has not, however, continued uniformly throughout the decade; taking the four States together, probably two-thirds of the increase was during the first half of the decade. The industries of these States are almost purely agricultural, and are dependent on the supply of moisture either in the form of rain or irrigation. Through these States passes what is known as the sub-humid belt, a strip of country several degrees in width, in which, during rainy years, there is an abundance of moisture for the needs of crops, while in the years when the rainfall is below the average, the supply is deficient. In this region little provision has been made for artificial irrigation. Into this region the settlers flocked in large numbers in the early years of the decade, drawn thither by the fertility of the land, and by the fact that for a few years the rainfall had been sufficient for the needs of agriculture. During the last two or three years of the decade, however, the conditions of rainfall have materially changed. It has fallen decidedly below the normal, and the settlers, having no provision for storage and irrigation, have been forced to emigrate. In Kansas, indeed, the years 1889 and 1890 showed an actual decrease. Thousands of families had left for Oklahoma and the Rocky Mountains. In the same way the other groups might be considered, and it might be shown that geographical conditions had more or less influenced the rate of increase of the population. It may be stated that the population of Oklahoma, in June 1890, was 61,834.

Exploration in the Selkirk Mountains.—During the months of July and August, 1890, Messrs. Harold Topham, Huber, Sultzer, and Forster continued the exploration of the Selkirk range (British Columbia), commenced by Mr. Topham in the spring of 1888, and continued by the Rev. W. Spotswood Green in the summer of that year. They ascended the Beaver Valley to the top of the watershed, where they found two fine glaciers, from one of which the Beaver river, running north, derives its source, whilst from the other the Duncan river springs and runs south into the Kootenay district. They ascended the Beaver glacier and climbed a fine snow-peak about 10,000 feet high. Mount Deville, at the head of the Deville glacier, was climbed, and after several unsuccessful attempts they succeeded in reaching the summit of Mount Purity, which lies south of the Dawson range. Mounts Fox and Donkin were also ascended. Messrs. Huber and Sultzer ascended Mount Sir Donald, and the latter gentleman reached the top of a peak to the north of Glazier House. This peak he estimated to be within a few feet of the height of Sir Donald, and he considered that a peak in the same range as that which he ascended is even higher than Sir Donald, which latter mountain has hitherto been considered the highest of the Selkirk Mountains. The country impresses the visitor by the great extent of ice and snow. The

glaciers are very numerous, and although they are not nearly so large as those of Switzerland, yet they contain in all probability an equal area of ice. The peaks, although not comparable with those in Switzerland in height or in difficulty to the climber, are very numerous and beautiful. The Selkirk range offers a large field to the mountain explorer. Its mountains are exceedingly difficult of approach, owing to the dense vegetation in the valleys; and it must not be forgotten that guides and porters with a knowledge of mountaineering are quite unattainable. Mr. Topham hopes to produce from the rough survey the party made, and from the numerous and excellent photographs taken by Mr. Huber, a fairly accurate map of the country travelled over.

Mr. Ravenstein's "Lands of the Globe still available for European Settlement."—In this paper, which appeared in the January 'Proceedings,' the following errata occur:—In the table on p. 27, "Asia, 850,000,000," should be "830,000,000"; on p. 28, the total in the first column of the table should be "28,269,000"; and on the map, "Centres of Population," the words "10 to 1 acre" should be "1 to 10 acres."

Note on the Map of Matabeleland and Mashonaland, Manica and Gazaland, issued in the present No.—By Mr. E. A. MAUND.

THE longitudes determined by Mr. Ellerton Fry along the road from Mafeking to Fort Salisbury by chronometer, have been recalculated at the Cape Observatory, where the chronometer was rated both before starting and after returning. These observations have altered the longitude of all places hitherto depending chiefly on the work of the late Thomas Baines, to the extent of 24 minutes on the east in the neighbourhood of Fort Salisbury, and of about 15 minutes on the west in the neighbourhood of Palla Camp. The latitudes of Baines, Livingstone, and Mohr hold good. Mohr, writing at Victoria Falls, says, "To ascertain the longitude I observed fourteen distances between the sun and moon, and the average of these gave a difference of only 4 (four) minutes of longitude from that obtained in the Masue stream" where "I measured eleven distances between the sun and moon, the result giving $26^{\circ} 32'$ E., the latitude being $17^{\circ} 59' 7''$ S." The Laager on the Masue stream lay 4 geographical miles S.W. $\frac{1}{4}$ W. of the centre of the falls. "The difference between the latitude I obtained and that given by Livingstone was only 35", by which I place the falls so much more to the north. Livingstone, who made his observations with a pocket chronometer which showed the mean Greenwich time, gives the longitude as $25^{\circ} 45'$ E., therefore I make my observation 44 minutes of longitude further east. The error of the compass by azimuth observation in 1870 was $20^{\circ} 0' 26''$ W." Baines writes, "Mr. Mohr's observations were taken with superior instruments and ample leisure."

This map has been constructed, therefore, on the basis of Mr. Ellerton Fry's observations for longitude north of Mafeking, and of Mr. Mohr's observations for longitude at the Victoria Falls and at Umsuazi's kraals. Mr. Fry agrees to within 4 minutes of longitude at Mafeking with the observations of Commander Bethell, R.N., and Lient. Mackay, R.E., as recorded in the trigonometrical survey of the Bechuanaland boundary by Captain Conder, R.E., but Mr. Fry had the advantage of telegraphic communication with the Cape Observatory, not enjoyed by Commander Bethell. The latitudes of Baines, Livingstone, Mohr, and Fry are in

agreement as above stated. The whole of Matabililand and Western Mashonaland is consequently shifted considerably to the westward, and contracted slightly in longitude. The map, as thus reconstructed, agrees somewhat better with the description of the country given by recent travellers than maps hitherto published, the compilers of which had not the advantage of Mr. Fry's valuable observations.

I have to thank Mr. John Bolton, of Stanford's Geographical Establishment, for the careful way in which he has worked in all the varying calculations. No one, I believe, is better versed in African geography, and I am confident that this map will be found as accurate as the greatest care can assure; at the same time being thoroughly up to date.

Obituary.

General Sir John Henry Lefroy, R.A., C.B., K.C.M.G., F.R.S., &c.*—

The subject of the following notice was born at Ashe, in Hampshire, on the 28th January, 1817. His father, who was rector of the parish, died in 1823, and after his death his mother removed, with her family of six sons and five daughters, to Itchel Manor, near Farnham, which had been left a few years before to her husband by his uncle, Mr. Maxwell.

Here the family lived quietly and frugally, for Mrs. Lefroy had but a slender income (allowed by the Court of Chancery) on which to bring up her large family; but the children were happy in the enjoyment of country life, and early imbibed that love of nature which was a marked characteristic of little Henry, as he was always called. There was in the house a large miscellaneous library, and here he was always happy; visiting it alone, and spending hours over its contents, and especially over books of travel or adventure. He was not a robust child, and often preferred the quiet of the library to boisterous outdoor games, delighting especially in long rambling country walks.

In 1826 he was sent to a school at Alton, where the teaching was indifferent. His compassion was excited for a boy smaller than himself who was far from his friends and a good deal bullied by a bigger tyrannical lad, and a warm friendship was formed with this boy, George Bennett, which lasted all through life, and although circumstances generally separated them, their mutual affection never wavered.

In 1828 he was removed to a school at Richmond, kept by Rev. G. Delafosse. Here he acquired a taste for Latin and Greek, especially delighting in Homer, but never mastering "the difficulty of derivations." The most marked effect of this school was, however, the influence of Mrs. Delafosse, the master's wife, of whom he wrote in 1858, "Few, indeed, there can be of 'her boys' who trace no better thoughts and heavenward aspirations to her fervent prayers, family, social, or private, her more than motherly tenderness and care, her refined and feminine, yet bright and energetic spirit. Our respect for her was unbounded—we knew her to be as good as she looked."

In 1828, Mrs. Lefroy had the offer of a midshipman's berth, and also of a cadetship at Woolwich for her son Henry, and she left the choice to him. He says, writing in 1858, "I had no fancy for the sea, and Divine goodness guided a boyish choice to the profession in which I have since had so many reasons for thankfulness." In those days the State gave a gratuitous education to a favoured few at both military

* By Sir Joseph D. Hooker, K.S.I., F.R.S.

schools, and his education, therefore, cost his family nothing after the age of fourteen, except the small charges for books and extras.

He entered the Royal Academy at Woolwich in January 1831, and remained there till 1834. He was the smallest boy but one of his division, and centre of the rear rank. The moral tone of the Academy at that time was very bad, but it had its code of honour as to arrest, and this was so high that he says, "I never knew a cadet knowingly break his arrest, although it was considered lawful to stretch to one's full length out of the place of confinement, provided one toe remained within."

On leaving the Academy he came out first in fortification and second in mathematics, and on the 20th February, 1835, he joined the Royal Artillery at Woolwich, where he served for the next three years, only varied by duties on detachment at Purfleet or the Tower of London, one of which was to do duty with his battery on London Bridge on the day of the Queen's Coronation. It may be mentioned that when stationed at the Tower, there being no mess, he had to get his dinner at an eating house, where he frequently stinted his meals that he might have more to expend on books. Money was, indeed, then scarce with him; his mother could give him but a very small allowance in addition to his pay, and even from this she was glad to be released as soon as young Henry got a little remuneration for special work. When at Woolwich he joined with eight or nine young brother officers in a weekly meeting in each other's rooms for reading the Bible and prayer, on which account they received the nickname of "Saints," or "Methodists." With the sanction of the commandant and chaplain, these young men also opened an evening Sunday school for soldiers' children, who were otherwise entirely neglected.

In August 1837, he was ordered on detachment to Chatham, where he remained three months. There he availed himself eagerly of every opportunity for instruction that presented itself. There too Colonel Pasley, Captain Sandham, and Lieutenant Frome, R.E., gave more than a welcome to the young gunner who sought to improve himself. Besides going through the instruction given to young Engineers, he especially devoted himself to practical astronomy, which proved of unexpected value to him in after life. At this time, he says in his diary, "I worked very hard. I made it a rule not to pass more than six hours in bed and kept it with fair strictness, noting every morning when I went to bed, and when I got up."

In 1838, Dr. Gregory, mathematical professor at the R. Artillery Academy, put into his hands the MS. records of a Regimental Society, which had ceased to exist at the breaking out of the American War. The perusal of them encouraged Lefroy to bring forward a project which he and others had long cherished for securing for Artillery officers such opportunities of professional instruction as were enjoyed by young Engineer officers at Chatham. In furtherance of this object he drew up a paper on the subject, which, being signed by himself and a brother officer, Lieutenant F. Eardley Wilmot, was submitted to Colonel Cockburn, who was at the head of the Laboratory at Woolwich, as the officer most likely to advocate the cause. This Colonel Cockburn did warmly, and having obtained the sanction of necessary authorities, the Royal Artillery Institution* was launched, with Colonel Cockburn as its president and Lieutenant Lefroy as its secretary.

In April 1839, he received a letter from Major Sabine, afterwards Sir Edward, informing him that observations in connection with magnetical research were to be established at Canada, St. Helena, and the Cape of Good Hope, and saying that "Sir Alex. Dickson will probably look to you as the first person whose wishes he will ascertain." The offer followed and was eagerly accepted.

During the summer of this year he was sent with Lieutenants Eardley Wilmot and

* See 'Proceedings of the Royal Artillery Institution,' vol. i., Preface.

J. Riddell to Dublin to be instructed by Professor Humphrey Lloyd in magnetical work; so from this dates a life-long friendship with the professor, whom he describes as "the most delightful of men."

As this was the turning-point in Sir H. Lefroy's life, and the devotion of many years of it to science, it may be well here to recall the circumstances which led to it, which were the steps being then undertaken by H.M. Government towards effecting a magnetical survey of the globe.

In 1838, the action of Lieut.-Colonel Sabine (who was then engaged on a magnetical survey of the British Islands) in bringing before the meeting of the British Association at Newcastle the importance of the subject of terrestrial magnetism, led to the formation of a committee of that Association charged with the duty of making a representation on the subject to H.M. Government. This took the shape of a recommendation that magnetical observatories should be established in Canada, Ceylon, St. Helena, Van Diemen's Land, and the Cape of Good Hope, to make simultaneous observations with others existing or to be established elsewhere by foreign Powers. At the same time the Committee urged the importance of organising a naval expedition for taking simultaneous observations in high southern latitudes.

These recommendations having been favourably received and acted upon, arrangements were made for taking on board the ships intended for service in the Southern Ocean the officers and materials for the observatories to be established at St. Helena, the Cape of Good Hope, and Van Diemen's Land. To the first of these Lieut. Lefroy was appointed; to the second his friend and brother officer Lieut. Wilmot, both on the recommendation of Lieut.-Colonel Sabine.

On the 25th September, 1839, Lieut. Lefroy embarked on board H.M.S. *Terror*, for St. Helena. His mental and bodily activity on board ship has been described by his companions as remarkable. His magnetical studies were prosecuted in his cabin and he displayed the activity of a cat in his excursions in the rigging, when the seamen vainly endeavoured to secure and exact toll or tribute from a landsman, all the more jealously regarded as being a "soldier officer." At Madeira the two Lieutenants took barometers to the top of the Pico Ruivo, measured its altitude, and descended with armfuls of plants for the naturalists of the expedition: the results of these measurements are given in the narrative of the voyage of the Antarctic expedition (pp. 5 and 329).

The voyage to St. Helena was a long one, the ships taking a devious course by the Canaries and the Cape de Verde Islands, and the barren rocks of St. Paul's, Trinidad, and Martin Vas off the Brazilian coast, as the exigencies of the survey demanded, arriving at St. James's Bay on the last day of January 1840.

In 1842, Lieut. Lefroy was transferred from the observatory at St. Helena to that of Toronto, to which he remained attached till 1853, having meanwhile in 1845 been promoted to a captaincy.

It was during his residence in Canada that he made that very remarkable journey which whilst being undertaken for magnetic purposes, established his claim as a geographer. In April of 1843 he left Toronto, with instructions to proceed to Lachine, and thence to Hudson's Bay, partly by canoes and partly on snow-shoes; the principal object being the determination of the approximate position of the American forces of magnetic intensity. During its progress, he made two lengthy halts, the first at Fort Chippewyan, on Lake Athabasca, where (with the assistance of Corporal Henry, the sole companion of his journey) magnetical and meteorological observations were made every hour of the twenty-four, from Oct. 16th, 1843, to Feb. 29th, 1844; the second at Fort Simpson on the M'Kenzie river, where similar observations were made continuously during April and May 1844. During

this survey, Capt. Lefroy traversed about 5475 geographical miles by land and water, and observed at 314 stations *en route*. Considering the nature of the country, the severity of its winters, and the extreme delicacy of the instruments to be transported, the successful accomplishment of this duty was a feat of no ordinary difficulty and magnitude. The magnetic results were, after being discussed by himself, communicated to the Royal Society by Colonel Sabine,* and up to this time they are, as Captain Creak informs me, the chief authority for the determination of the approximate position of the focus of magnetic intensity in the North American Continent.

During the same expedition, many observations were taken of the Aurora Borealis which are the subject of two papers communicated, the first to the 'Philosophical Magazine,' vol. xxxvi. (1850) p. 456, and the second to 'Silliman's Journal,' vol. xiv. (1852) p. 153. Another paper was communicated to the American Association for the Advancement of Science in 1851, and is printed in the Proceedings of that body for that year (p. 175). It is entitled "A comparison of the apparent diurnal laws of the irregular fluctuations of the magnetical elements at the stations of observation in North America." It was also during his residence in America that he suggested the application of photography to the self-registration of magnetical and meteorological instruments ('Silliman's Journal,' vol. ix. (1850) p. 319).

In 1853, the Toronto Observatory was transferred to the Colonial Government, and in the same year Captain Lefroy returned to England, and took command of his battery at Woolwich, shortly after which, in 1854, he accepted the secretaryship (for the second time) of that Royal Artillery Institution which he himself founded, and being relieved from military duties, he was enabled to devote his whole time to its interests.

During this period, war being imminent, though not declared, he became impressed with the fact of the want of a good and portable book for the use of Artillery officers in the field; and with characteristic energy he forthwith convened a small meeting of his brother officers to consider the matter. The result was the decision that the compilation of the work should be undertaken by himself. It appeared shortly afterwards as 'The Handbook of Field Artillery for the use of Officers.' The work was forthwith adopted by the Institution as one of its publications, and 300 copies were sent out by the *Jason* to the Crimea in July 1854. It was subsequently issued under the authority of the War Office as a text-book for Artillery officers, and remained in force till 1884, when it was replaced by the present 'Handbook for Field Service.' In the preface of this latter due acknowledgment is made of Captain Lefroy as being its author. It should be recorded that the whole proceeds of sale were made over to the Institution.

In 1854, Captain Lefroy was selected by the Duke of Newcastle, then Minister of War, as his professional adviser on the subject of Artillery. The post carried no military title, the department being wholly civil. The duties were the examination and reporting on military inventions. The acceptance of this appointment, which was officially gazetted as 'Scientific adviser on subjects of Artillery and Inventions,' required his resignation of the executive duties of his battery, and the consent of Sir Hew Ross to his being "seconded" from the regiment for two years. This was

* The magnetical and meteorological observations were also published in a separate work by H.M. Government. Captain Creak informs me that in this work the observations are discussed at considerable length in conjunction with similar observations made at Sitka, Toronto, and Philadelphia, and that they form a valuable contribution to the science of terrestrial magnetism.

obtained, with the guarantee that it should not interfere with his professional prospects. Another officer was promoted to his company, with which from that date he ceased to have any official connection. He entered on the duties of the office in December 1854, when in addition to his scientific work, the "Foreign Legions," with all the curious correspondence concerning them, was thrown on his shoulders.

In October 1855, Lieutenant-Colonel Lefroy was sent by the Secretary for War, then Lord Panmure (at two days' notice), to Constantinople, with instructions to confer with Brigadier-General Storck on the condition of the Hospital Staff in the East, on the provision of additional barrack accommodation for troops about to be sent out from England, and to take steps under the guidance of the principal medical officer for the accommodation of the sick at Scutari. It was during this mission that General Lefroy made the acquaintance of Miss Nightingale, to whose valuable work he gave a cordial support that was gratefully acknowledged; and with whom he corresponded on the subject of military hospitals and nurses from 1856 to 1896.

In 1856, a reorganisation of the system of military education was undertaken by the Secretary of War, who confided the scheme (which included the superintendence of military schools) to Lieutenant-Colonel Lefroy, informing him that he had fixed on him as the future "Inspector-General," and instructing him to prepare a detailed scheme of the whole system. A draft scheme was accordingly prepared, and as far acted upon, that the Government laid out about 100,000*l.* on a staff college at Sandhurst, and in 1857 Lefroy was gazetted "Inspector-General of Army Schools." A report of the work done was laid before Parliament in the following year, relating to which the *Examiner* thus writes:—"Lord Panmure, impressed with the great importance of the subject . . . placed the Army schools and all matters connected with regimental education under the direction of Colonel Lefroy, an officer peculiarly fitted for the duty entrusted to him, and whose admirable report addressed to the Secretary for War shows not only his ability to deal with a very difficult subject, but how completely he has his heart in his work. . . . Few men amongst the many improvements effected by Colonel Lefroy in the reorganisation of a large staff of trained administrators. Indeed to this measure the success of the present Army school system is mainly attributable."

The Royal Commission on the Defence of the United Kingdom was appointed by Mr. Sidney Herbert in August 1859, and Lieutenant-General Lefroy was appointed to it; the other members being Generals Sir Henry Jones (Chairman), Sir Thomas Campbell, and Sir Frederick Abbott, Admiral G. Elliot, Captain August Key, R.N., and Mr. James Ferguson. The recommendations of this Commission led to the reconstruction of the defences of Portsmouth, Plymouth, Dover, Cork, &c., at an expenditure of several millions. Notwithstanding the attacks on all military science during the last thirty years, these works still form the main defence of the United Kingdom. In the same year, a European war being imminent, Lord Lefroy's Government determined on sending out a commission to the Mediterranean to report on the works and fortresses of Gibraltar and Malta, and selected for the purpose General Jones, R.N., and Colonel Lefroy, whose operations were afterwards recorded in the *Times* journals.

Meanwhile the office of Inspector-General of Military Education having been abolished, Colonel Lefroy was appointed in 1865, Secretary of the "Military Education Committee," and was promoted to be its President in 1874. The duties of this important committee occupied his attention till 1889, when he was appointed "General Secretary of Ordnance" at the War Office. He held for several years and a very important position at the commencement of those great changes which have led to such marvellous developments in the size and power of modern armaments: changes which are hardly yet at an end. His scientific acquaintance coupled with his

untiring energy, enabling him to be of great service at a critical period in the history of our war-material.

General Lefroy's employment under the War Office terminated in 1870, when he served on a Committee presided over by Sir Frederick Chapman, Inspector-General of Fortifications, to consider the torpedo defences of certain important positions on our coasts.

A very different sphere of work was opened to Lieut.-General Lefroy by the offer of the post of Governor and Commander-in-Chief of the Bermudas, to which he was gazetted in 1871, and which he held until 1877. Here his mental activity and superabundant energy had only too fair a field of exercise. His cardiac system was not equal to meet his demand upon it, and symptoms of feeble heart's action appeared, that terminated fatally twelve years afterwards. Meanwhile, everything concerning the welfare of his Government, civil and military, social, literary, and scientific, found in him an ardent advocate and operative. The coloured races never had a firmer friend nor one more determined to secure their having fair play. He collected from all sources the original documents relating to the early history of the colony (1515-1685), and published them in two bulky volumes of upwards of 700 pages each,* accompanied with maps, charts, and views; he collected the indigenous flora of the islands, and devoted much time and correspondence with England to the introduction of new cereals and vegetables, having a skilled gardener sent out from England at his own expense to superintend their culture; and he resumed his meteorological and magnetical observations.

With the expiration of his Commander-in-Chiefship in Bermuda, General Lefroy's active military career ended. The only other public service which he undertook was the Governorship of Tasmania (1880-1882), where there were no regular troops. During his residence in the latter island he communicated to its Royal Society a paper entitled "On the Magnetic Variation at Hobart," which gives the results of his observations with the 4 inch azimuth compass made in 1881. In this paper he also discusses the question of the secular change of the magnetic variation on the southern coasts of Australia.

This was followed on his return to England by his last contribution to magnetic science, the publication in 1883 of the diary of his Canadian magnetic survey.† Of this important work Commander Creak has kindly supplied the following notice:—"It may be considered a résumé of the principal magnetic work of Lefroy's life, and in these days when local magnetic disturbance is known to be so extensive in the North American continent, both the text and the accompanying maps can hardly fail to be of great interest to magneticians. Amongst other points, it will be remarked that in drawing the lines of equal value of magnetic intensity on the maps of his survey, Lefroy's differ considerably from those of Sabine published in the 'Philosophical Transactions' in 1846 and 1872. The grounds of this difference from so great an authority as Sabine are given in the preface to the work. It appears that in following out his system of showing with the greatest degree of

* 'Memorials of the Discovery and Early Settlement of the Bermudas or Somers Islands (1515-1685) compiled from the Colonial Records and other authentic sources, by Lieut.-Gen. Sir J. H. Lefroy, C.B., K.C.M.G., &c., 2 vols., Longmans & Co., 1879. At a subsequent period General Lefroy edited for the Hakluyt Society 'The History of the Bermudas, or Summers Islands,' from a MS. in the Sloane Collection in the British Museum, London, 1882.

† 'Diary of a Magnetic Survey of a portion of the Dominion of Canada, &c., in the years 1842-1844, by Lieut., now Gen., Sir J. H. Lefroy, C.B., K.C.M.G., F.R.S.,' London 1883.

accuracy possible normal lines of equal value of the magnetic elements, Sabine left out some of Lefroy's observations, which he considered might possibly be open to question. Lefroy on the other hand, knowing from personal experience the value of each one of his results, rejected none, and produces evidence to show that his isodynamic lines are 'locally correct.' The differences between the two magneticians may be summed up in this: Sabine sought for the best mean results of a great continent, Lefroy gave the exact results for a portion of that continent."

Of General Lefroy's disinterested exertions in advancement of the moral and physical well-being of the soldier and his family it is impossible to speak too highly. They date from the earliest days of his military career, and were continued with undiminished zeal till the end. His good works were in this respect unpretending and unobtrusive, his right hand not knowing what his left did. He was Honorary Secretary of the Patriotic Fund for the Relief of the Widows and Orphans of the Crimean Soldiery, and afterwards a Commissioner of the Fund. He was an active member of the Committee of the Royal School for the Daughters of Officers of the Army, and was for some years Chairman of its House Committee; and he was instrumental in the reorganisation of the Artillery Marriage Society, and watched over its subsequent working.

Nor had he less at heart the interests of his brother officers, as an instance of which should be recorded his labours in the Rotunda (Museum of Artillery) at Woolwich. This most valuable and now instructive collection was in a state of neglect and disorder, till its classification and cataloguing were undertaken by General Lefroy in 1863-4. It was a labour of love, and occupied his evenings during many months of a most busy time. It was no easy task; objects were misplaced, tickets lost, and deficiencies of all sorts had to be supplied. And surely no man in the service was so well qualified for the task, for to extensive reading and a thorough knowledge of the implements of war he added archæological knowledge of no mean order.

It was during General Lefroy's government of Bermuda that he undertook to investigate the subject of courts-martial, the sentences of which he considered to be, as a rule, too severe. He reported on the subject to the Minister for War, and on his return to England was put into communication with Sir Henry (now Lord) Thring, who was then constructing the Amended Mutiny Act. In every Institution connected with the regiment he took the greatest interest, and his simple and earnest character won for him the respect and esteem of his brother officers.

Nor was he less generous in giving his time and attention to scientific institutions. He was elected a Fellow of the Royal Society in 1848, and of the Royal Geographical in 1853, and was a LL.D. of the McGill University, Montreal. He was for two years a member of the Kew Committee of the Royal Society, of the British Association, and of other bodies. Whilst serving at Toronto in 1849, he founded the Canadian Institution for the Encouragement of Science, which still flourishes, and while in Tasmania he took an active part in the proceedings of the Royal Society of that island. In 1884 he was appointed President of the Geographical Section of the meeting of the British Association that assembled in Canada, and there delivered his presidential address.

Other scientific papers by General Lefroy not mentioned in the preceding pages are "On the influence of the moon on the atmospheric pressure as deduced from observations of the barometer made in St. Helena" (Roy. Soc. Proc., 1842, p. 395); "Barometric and thermometric measurements of heights in North America" (Geogr. Soc. Jour., 1846, p. 263); "A comparison of the apparent diurnal laws of the irregular fluctuations of the magnetical elements at the stations of observation in North America" (Amer. Assoc. Proc., 1851, p. 175); "Remarks on the winter of 1851,

1852, in Canada" (Sillim. Jour., vol. xiv. p. 135); "Remarks on thermometric registers" (Canad. Journ., vol. i. pp. 29, 75). He also contributed to various periodicals papers "On the meteorology of St. Helena" (1841); "A visit to the Mammoth Cave in Kentucky" (1850); "On the probable number of the Indian population of America" (1851); and "On the chemical analysis of soils in Bermuda."

In person General Lefroy was tall, with sharply-cut features, remarkably slim, alert in movement, genial in manner, cheerful in disposition, and chivalrous by nature. He was created a C.B. in 1870, and K.C.M.G. in 1877. For several years after his retirement from public life he resided in London (Queen's Gate South Kensington), but failing health required his removal to the country, Cornwall being recommended. There, at Lewarne, near Liskeard, he died on the 11th April, 1890, and he was interred near his birthplace at Crondal in Hampshire.

General Lefroy married in 1846 the daughter of Sir John B. Robinson, Bart., C.B., who died in 1859, and secondly the daughter of Lieut.-Colonel T. Dundas of Fingask, and widow of Colonel Armine Mountain, C.B., who survives him, as do two sons and two daughters.

REPORT OF THE EVENING MEETINGS, SESSION 1890-1.

Fourth Meeting, 19th January, 1891.—The Right Hon. Sir M. E. GRANT DUFF, G.C.S.I., &c., President, in the Chair.

ELECTIONS.—*Howard Thomas Caine, Esq.; Fitz Evans Eversley, Esq.; Henry Chichester Hart, Esq., J.P., &c.; Captain James Inman; Lieutenant Gerald Oliver, B.N.; Alfred Monteil, Esq.*

The paper read was:—

"The Meteorological Results of the *Challenger* Expedition in relation to Physical Geography." By Alexander Buchan, Esq., LL.D. Will be published in a subsequent number of the 'Proceedings.'

PROCEEDINGS OF FOREIGN SOCIETIES.

Geographical Society of Paris.—November 21st, 1890: Comte DE BIZEMONT in the Chair.

DR. TEN KATE'S EXPEDITION.

Prince Roland Bonaparte announced the departure of Dr. Ten Kate upon a mission of exploration to the Sunda Islands, and more particularly to Flores, Timor, and Sumbawa. He intended to stay a considerable time in the latter island, which is not well known. The expedition, which is under the auspices of the Geographical Society of Amsterdam, will last about a year.

SURVEY OF THE VALLEY OF THE PARAPANEMA.

M. H. Gorceix of the School of Mines at Ouro Preto (Brazil), forwarded, on behalf of M. O.-A. Derby, head of the Commission charged with the Geographical and Geological Survey of São Paulo, an atlas of twenty-six maps representing, on

the scale of 1: 50,000, the course of the Parapanema and of its affluent, the Itapetininga. This work was the first undertaken by the commission, and would form a valuable addition to the cartography of the interior of Brazil.

M. E. BLANE'S JOURNEY IN CENTRAL ASIA.

Some particulars were given by M. C. Gauthiot respecting M. Blane's expedition in Central Asia. The traveller was entrusted by the French Government with a mission to study the Trans-Caspian Railways, and the products of Russian Turkestan. On the completion of this task he determined to cross the mountains and to visit Kashgar. He set out from Osh, the last Russian town of Fergana, on the 23rd October, and, crossing the Terek Dawan and two other ranges of less elevation, entered the basin of the Kok-Su and of the Tarim. He arrived at Kashgar on November 9th. He intended to return by the passes over the mountains of Taldek and Kizil Beg.

NEW GEOGRAPHICAL PUBLICATIONS.

(By J. SCOTT KELTIE, *Librarian* R.G.S.)

ASIA.

Miyabe, K.—The Flora of the Kurile Islands.—Memoirs of the Boston Society of Natural History, vol. iv. No. 7. Boston, 1890: 4to., map. [Presented by the Society.]

This memoir is preceded by an introduction containing a brief sketch of the physical geography of the Kurile Islands, and a few remarks on the early visits of naturalists there.

Ramsay, Prof. W. M.—The Historical Geography of Asia Minor: published for the Royal Geographical Society by John Murray, 1890 (issued also as vol. iv. of the Society's Supplementary Papers). Price (to the public) 18s. Free to Fellows on application at the Society's Office.

It is desirable to bring before our readers the exceptional character of this contribution to historical geography, which has grown out of a lecture given at one of the evening meetings of the Society.

Prof. Ramsay owed the opportunities he has had of carrying out the researches, the results of which are here given, to the endowments of Oxford, and to the grants made by a body of persons specially interested in Asia Minor exploration, and by the Council of our Society. In France his volume would have been issued with every luxury at the expense of the State. With us it would hardly have found any public or private body prepared to guarantee the cost of its publication but for the action of our Council. So far are we still in England from recognising the essential relations between geography and correct topography and classical studies; and so necessary is it still to insist that the classics were men before they were books, and that no student who has not a fairly accurate idea of the country and climate they lived in can rightly understand their history or their literature. In undertaking to issue, with adequate maps, Prof. Ramsay's work, our Council has taken another step in furtherance of the scheme of action it laid down for itself when it determined to force on the attention of the centres of English education the unworthy position of geographical teaching and geographical research in this country. For the volume just issued is a striking proof of the advantages of geographical studies at a university, and of their intimate relation to classics and history, and a practical protest against the opinion of those who would limit the study of antiquity to the fireside perusal of a few great authors. As Prof. Ramsay truly writes, "no one who has familiarised himself with Attic history in books,

"and has afterwards ascended Pentelicus, and seen that history spread forth before him in the valleys and mountains and seas that have moulded it, will ever disbelieve in the value of topography as an aid to history. The justification of Part II. is, that if we are ever to understand the history of Asia Minor, we must know the places in which that history was transacted." Part II., "A Sketch of the Historical Geography of the Provinces," is, in fact, the bulk of the work; Part I., "General reflections on the effect exercised by natural situation and surroundings on the history of the population," being no more than an introductory chapter. Prof. Ramsay is his own critic, and a severe one. He warns the ordinary reader that he will find the book a mass of dry dust and lifeless details. The work, as a whole, is no doubt susceptible of improvements in arrangement, and will hardly be read except by students; but in the details given—as the author justly adds—human interests are latent, and only wait the touch of the historian to spring into life. Prof. Ramsay is so interesting and suggestive, and at times eloquent (pp. 23-24), on the rare occasions when he allows himself to comment on his topographical facts, that his readers will wish him time and opportunity to do so at more adequate length. In his pages the old routes of Persian, Greek, and Roman commerce, and the sites of the cities they connected, are determined and revised. New side-lights are thrown on the past. But the "practical man" may also learn something for the present. "The same trade routes now lead to Marseilles and Liverpool, which once led to Rome." And the politician who desires to prepare for the future may do well to read and reflect on the remarks, on pp. 82-83, on the character of modern Turkish roads, and the relations of Russia to Armenia—and to note that "Cilicia id est Armenia." Whenever Armenia changes masters it will become better known than it is at present that Armenia may be held with some reason to extend to a port on the Gulf of Alexandretta!

But it would be misleading to represent that modern questions occupy any large part of Prof. Ramsay's work, or are treated otherwise than by incidental and rare, if pregnant, allusions. His first object has been to reconstruct, on the basis of careful local and historical research, the ancient map of Asia Minor. His work in its present form is a mass of original and valuable materials for classical and mediæval students and scholars, such as is rarely proffered them. He is forced, by the limits of space in the present volume, only to hint how such material may be used. But the "local history of Asia Minor since 1883," which he promises, should be a work of very wide interest and importance.—
[D. W. Freshfield.]

AFRICA.

[Jameson, James S.]—Story of the Rear Column of the Stanley Relief Expedition. By the late James S. Jameson, Naturalist to the Expedition. Edited by Mrs. J. S. Jameson. With portrait, map, and illustrations from the author's sketches. London, E. H. Porter, 1890: 8vo., pp. xxii. and 455. Price 16s. [Presented by Mrs. Jameson.]

This is one more contribution towards the complete story of the unfortunate rear column. There is much in the book relating to that story of great, if sad, interest; but into the unfortunate details we cannot enter in these pages. There is, however, much of interest in the observations of the author on the people of the Congo and Aruwimi, and more still on the natural history of the expedition. In the latter Mr. Jameson was specially interested, and the copious appendices will be appreciated by the naturalist. Mr. Jameson was also somewhat of an artist, and the very numerous sketches in the volume form a great attraction. There is a chart of the river from Stanley Falls to Kasongo.

Maunoir, [M.]—Congrès des Sociétés Savantes. Discours prononcé à la Séance Générale du Congrès le samedi, 31 mai 1890. Paris, Imprimerie Nationale, 1890: 8vo., pp. 41. [Presented by the Author.]

This is a useful résumé of the exploring work done by Frenchmen in Africa during the past century.

Meyer, [Dr.] Hans.—Across East African Glaciers. An account of the First Ascent of Kilima-njaro. Translated from the German by E. H. S. Calder. London, G. Philip & Son, 1891: small 4to., pp. xx. and 404, maps, photographs, &c. Price 32s. [Presented by the Publishers.]

Dr. Meyer has already given our Fellows ('Proceedings R.G.S.' vol. xii. p. 331) some account of his second visit to Kilima-njaro in company with Herr Purtscheller of Salzburg, a well-known Alpine mountaineer. The two travellers succeeded in reaching the summit of the icy dome of Kibo, and explored thoroughly the rock-ridges of its sister-peak Mawenzi, although they failed to scale their highest summit. Exceptional pains and taste have been bestowed on the preparation of the work which forms the permanent record of this interesting journey. The narrative is clear and concise and in parts picturesque. The translator has shown remarkable literary skill as well as accuracy. Dr. Meyer's photographs are excellent, and they are supplemented by beautiful reproductions of drawings by an English artist, Mr. E. T. Compton, who first made his reputation in Alpine circles, but who here shows himself equally master of tropical scenery. There is in the matter of illustration only one cause for regret, that Dr. Meyer did not carry his camera to the crater-rim. A fancy sketch is but a poor substitute for such a series of views as might have been obtained, or even for the outlines published in 'Petermann's Mitteilungen.' There are three good maps, of which the most important is that of the mountain on a scale of 1:85,000. The following remarks of Dr. Hassenstein explain its construction.

"This map is based upon the observed latitudes of the Mawenzi camp (3° 6' 36" S.) and the Kibo camp (3° 7' 14" S.) combined with the distance between these two localities. This distance, as deduced from the itineraries and the triangulation, amounts to about 5, certainly not under 4 km. (2½ miles). Dr. Meyer, who apparently trusted to his astronomical observations, did not measure a base-line, an omission which one of his successors may possibly be in a position to make good."

The letterpress gives a full account of Dr. Meyer's journey from Mombasa, his various mountain ascents and explorations, and of two short subsequent excursions to the Ugweno Hills and to the south-western flanks of Kibo. The description given of the Kilima-njaro region is on the whole very favourable, and there seems every reason to believe that these tropical highlands may in the future prove a valuable possession to Germany. Dr. Meyer, however, is careful to warn his countrymen that the present products of the district are of little or no commercial value, and that much skill, patience, and capital will be needed for the development of their recent acquisition. He complains, moreover, that the key of Kilima-njaro, Taveta, has been left in the hands of England.

The task set before Dr. Meyer and Herr Purtscheller was to complete our physical knowledge of the upper region of the great volcano. For its full accomplishment it was requisite that they should gain the summit and ascertain its features, examine closely the glacial phenomena of the mountain, and take measurements of height which might confirm or modify the result obtained by triangulation by Herr Kersten, the companion of Von der Decken.

To a great extent the travellers were successful: they reached on three occasions the summit ridge of Kibo, they scaled its loftiest crag, and descended into the snow-filled crater, ascertaining that its névé serves as the reservoir of a glacier at least four miles long which descends to an elevation estimated at 12,500 feet. The course of this great icestream and its lower extremity were unfortunately left unvisited. With regard to measurements, it appears that Dr. Meyer carried to the top only two aneroids, a prismatic compass, and a common thermometer; his boiling-point observations appear to have been taken in camp at intervals of several days. But however this may be, and however carefully the needful corrections of the barometrical readings may have been calculated, his measurements cannot, we fear, be considered as more than approximative, and the height of the peak still remains to be finally determined. The following are the present figures:—Herr Kersten, 18,681 feet; Dr. Meyer, 1887, 19,852 feet; 1889, 19,718 feet. The lower limit of glaciers on the different sides of the mountain varies, according to Dr. Meyer, between 18,700 feet on

the north, and 13,000 to 12,000 feet on the south and west. This great difference is sufficiently accounted for by atmospheric causes.

Dr. Meyer notices the existence of a number of icefields of the class technically known as "glaciers remaniés" which owe their existence to avalanches. One of these on the north side is described as lying 3000 feet below the icecap. It seems open to doubt whether it is a true glacier or a heap of glacial debris. The snow deposited on the top of the mountain passes, probably owing to the great oscillations of temperature and rapid infiltration, more quickly from the condition of névé into glacier ice than does snow amongst European mountains. Very low night temperatures are recorded, amongst others 7° F. in a cave with a narrow opening at 15,390 feet. The sudden variations of 50° F. and more in the temperature must be one of the greatest trials to the mountaineer in Africa.

Dr. Meyer has, it will be gathered, left some substantial work for his followers, but he has done a great deal more than any of his predecessors. He has found the key to the mountain by proving that a fairly active traveller may, at the favourable season, reach a spot within ten minutes of the rim of the crater by easy rocks and without touching snow (p. 183). Whether this spot is above or below the lowest point in the crater-rim (Hans Meyer Notch) is somewhat uncertain (see *post*). It must not be thought, however, that Dr. Meyer did not himself encounter serious difficulties, physical as well as moral, both in his failure in 1887 and in his first ascent by the south-east glacier. De Saussure faced real perils on Mont Blanc, though a hundred years later it is overrun by tourists, and a member of the Académie des Sciences, M. Jannsen, has been able to prove, as he puts it, "the portability of savants to great altitudes," by being dragged to the summit and back in a sledge of his own invention.

The full and instructive physical description of the mountain which forms the chief part of Dr. Meyer's final chapter, deserves careful study. It is supplemented by the lists of botanical and geological specimens contained in the appendix, and by a table of heights worked out from the author's observations by Dr. Wagner.

Several of the topographical statements and altitudes seem to stand in need of revision. The diameter of the mountain at heights of 14,100 and 19,700 feet is said to be 5200 and 2200 yards respectively, while the slope between the two elevations is given as 21° (p. 298). The "Hans Meyer Notch" is said to be 18,860 feet (p. 314), the "ice below it" 18,914 feet (p. 378). The reader is not told how the heights of points not reached were calculated, e.g. the summit of Mawenzi. The heights as calculated by Dr. Wagner in the table in the appendix do not in all cases exactly correspond with those in the text and maps; nor do those given in the 1:85,000 map (English edition) in all cases correspond with those in the similar map in the German edition, e.g. 5730 and 5735 mètres are reproduced as 18,800 and 18,910 feet. It may be noted also that Herr Meyer reduces by a matter of about 1000 feet several of the heights he recorded in 1887.

The volume begins with a reference to Ptolemy's Geography. The author, following Mr. Ravenstein, thinks that the originals of the classical geographer's Nilotic lakes and snow mountains are to be found in Abyssinia, and that they were transferred by a happy accident to the exact localities where such lakes and mountains exist in Central Africa. This is not the place to enter into the discussion; it is enough to refer to the opinion expressed by Sir E. Bunbury in his 'Ancient Geography,' which appears to us on many accounts the preferable one.

Dr. Meyer turns from classical geographers to his immediate predecessors. In one instance at least he has been led into injustice and very obvious self-contradiction. He calls in question, amongst others, two statements made by Mr. H. H. Johnston: that he found rime on the ground in October at 8600 feet, and that he walked from a certain camp to "the base" of Kimawenzi and back in a day. He also argues that the English traveller failed to reach a point higher than New, that is above 13,000 feet, on Kibo. Now Dr. Meyer has himself recorded that he found rime on the grass at 8710 feet on November 1st (p. 131). His map shows Mr. Johnston's "Herculean" walk to have been in all 18 miles, and his narrative that his own heavily laden porters covered the first

five of these miles in three hours (p. 163). Again, he refers (p. 137) to certain remarkable tortoise-shell-shaped rocks, the height of which he calculates at 12,979 feet, as "previously described by Johnston." Mr. Johnston estimated their height at about 13,000 feet, and states that he climbed on for two and a half hours above them. Dr. Meyer gives the vegetation limit as 15,000 feet on Kibo, 15,700 feet on Mawenzi; Mr. Johnston as 15,450 feet on Kibo. There is no serious discrepancy in these figures, which agree indeed much more closely than those of Herr Meyer's two journeys. If we are further right in recognising Mr. Johnston's "landmark" as the Red Hill and not, as Dr. Meyer has done, as the Front Hill of his maps, all difficulty disappears. To Mr. Johnston, at any rate, belongs the credit of having first proved to mountaineers by his admirable drawings the existence of glaciers on Kibo (see 'Alpine Journal,' vol. xiii. pp. 575-7). And it seems far from impossible that his estimate of the character of the ascent may be that adopted by any members of the Alpine Club who may attempt hereafter to follow in the footsteps of the small grey antelope whose body was strangely discovered by Dr. Meyer on the inner snows of the crater.

Attention has here been called to some slips or mistakes in detail in Dr. Meyer's work. It is but just to add that they are for the most part of minor importance. Its merits speak for themselves. The volume is a model of an attractive and skilfully arranged narrative of travel; and to all concerned in its production, and especially to the author, gratitude is due not only from geographers but from all readers who "love the glories of the world."—[D. W. Freshfield.]

AMERICA.

Conkling, Alfred R.—Appleton's Guide to Mexico. 3rd edition, revised. New York, D. Appleton & Co., 1889: cr. 8vo., pp. xvii. and 390. Price 8s. 6d.

Both the tourist and the settler in Mexico will find in this guide a deal of useful information in a condensed form, regarding the resources and general condition of the country. It is divided into two parts. Part I. consists of a compendium of general information for tourists and settlers; while Part II. deals with the various routes to different parts of the country, with descriptions of the places on the lines of railway. There is also a chapter on Guatemala, and an appendix consisting of a vocabulary of Spanish words, and a collection of colloquial phrases. The volume is illustrated, and contains a railway-map of Mexico.

Gooch, F. C.—Face to Face with the Mexicans: the domestic life, educational, social, and business ways, statesmanship and literature, legendary and general history of the Mexican people. London, Low & Co., 1890: large 8vo., pp. 584. Price 16s. [Presented by the Publishers.]

This volume embodies the results of seven years' intercourse with the Mexicans. The author, an American lady, visited and resided in Mexico for the purpose of studying the life and character of the people. Upon this subject she has a great deal that is new to tell, and her chapters are full of instructive information bearing on all phases of Mexican life. A number of illustrations add considerably to the interest of the work, which may be taken as a faithful representation of the Mexican people at home.

Reeves, A. M.—The Finding of Vineland the Good. The History of the Iceland Discovery of America: edited and translated from the earliest records by Arthur Middleton Reeves. Oxford University Press, 1890. Price 2l. 2s.

The difficulty, in recognising the stories of the discovery of America by Norsemen as containing historical facts, has been that the events are said to have taken place more than three centuries before the date of the earliest manuscript. The events, as we have them, are not, it has been urged, derived from narratives of personal adventure, but from oft-repeated stories of a long succession of fireside narrators. This view is supported to some extent by the

fact that there are discrepancies between the story of the American voyages as told in the 'Codex Flateyensis,' and the narrative in the 'Hauksbok.'

The publication of Mr. Reeves' 'Finding of Wineland the Good,' which has been printed at the Oxford University Press, will enable geographers to form a satisfactory conclusion on this interesting point. It consists of the Icelandic texts of the 'Hauksbok,' and of the two Greenland narratives in the 'Codex Flateyensis,' with beautifully executed facsimile pages of the manuscripts, alternating with a printed version. These texts are preceded by English translations, notices of incidental mentions of Wineland, and an introduction; and are followed by explanatory notes.

The narrative in the Saga of Erik the Red is simple and straightforward, and is almost entirely free from those marvels which are the usual accompaniments of tales which have been handed down through a succession of storytellers. This favours the belief that the earliest extant manuscript is a copy from an earlier document now lost, and that the narrative was written down within a short time of the events having taken place. On the whole we may safely accept the main facts of the voyages both of Leif and Karlsefni, the discoveries of Helluland—the coast covered with large flat stones; of Markland, the forest-clad coast; and of Wineland, where wild grapes were gathered, and where the Norsemen wintered. The absence of any remains of their sojourn, after a lapse of many centuries, is not surprising. Even in Greenland, where there were numerous permanent Norse settlements, only three runic inscriptions have been found.

But there are some incidental proofs of the truth of the Norse discoveries furnished by references to Wineland in very ancient documents. There is a passage in the 'Islandigabok,' written by Ari Thorgillson, of Iceland, in 1134, mentioning that Wineland was inhabited by Skrellings. In the 'Landnama-bok,' written in the same century, one Thord is mentioned as the father of Karlsefni, who discovered Wineland, and, in another place, an island is alluded to as "westward in the sea near Wineland." In the 'Kristni-Saga' the discovery by Leif is referred to as well-known. These incidental mentions of the voyages of discovery to the south-west of Greenland prove that they were a matter of notoriety in the tenth century, and make it very probable that there was then a written account of them, of which the existing manuscripts of the fourteenth century are copies.

The much-disputed question of the position of Wineland is not so easily settled. Prof. Rafn boldly placed it on the shores of Rhode Island and Connecticut, and still wilder theories have recently been propounded. But the material on which these theories are based is meagre in the extreme. The whole question hinges on a single short passage, the meaning of which is doubtful. The passage is as follows:—"On the shortest day of winter the sun was up between '*eyktarstad*' and '*dagmalastad*.'" If these words refer to hours, and if we knew what hours are intended, we should also know the length of the shortest day, and consequently the latitude. Rafn thought a day of nine hours was intended, and placed the latitude in $41^{\circ} 24'$. The astronomical calculations of Rafn were afterwards corrected, with a result fixing this latitude at $42^{\circ} 21'$, or the vicinity of Boston. The latest result leaves the question unsettled, merely establishing the position as having been to the southward of 49° N.

The work of Mr. Reeves is, on the whole, the most valuable contribution that has yet been published to the literature of the Norse discovery of America. Rejecting fanciful theories, it furnishes a complete body of material for forming a judgment, together with much valuable guidance in the form of judicious comments and well-digested notes.—[C. R. M.]

Shields, G. O.—The Big Game of North America. Its Habits, Habitat, Haunts, and Characteristics; How, When, and Where to Hunt it. By Judge John Dean Caton, Newton Hibbs ("Roxey Newton"), W. A. Perry ("Sillalicum"), W. P. Lett ("Algonquin"), A. W. Du Bray ("Gaucha"), W. M. Wolfe ("Shoshone"), Rev. J. Cooke ("Boone"), T. T. Van Dyke, W. B. Leffingwell, T. G. Farrell, Dr. R. B. Cantrell, Col. G. D. Alexander, M. E. Allison, Rev. Dr.

W. S. Rainsford, C. A. Cooper ("Sibyllene"), Dr. M. G. Ellzey, J. C. Nattrass Orin Belknap ("Uncle Fuller"), H. Biederbick, J. Fannin, Sergeant F. Long, D. Arrowsmith ("Sangamon"), C. W. Butler, and A. G. Requa. Edited by G. O. Shields ("Coquina"). London, Low & Co., 1890: 8vo., pp. 581 illustrations. Price 21s. [Presented by the Publishers.]

This volume consists of a series of essays dealing with every species of big game inhabiting the North American continent. Each essay is written by a specialist, who is fully acquainted with the habits and characteristics of the species he describes. Among the most important papers may be mentioned those on the Buffalo, by Orin Belknap; the Polar Bear, and the Musk-ox, furnished by survivors of the Greely Arctic Expedition; the Rocky Mountain Goat, by J. Fannin; the Peccary, or Mexican Wild Hog, by A. G. Requa; Mr. Hibbs's paper on Moose-hunting in the Rocky Mountains; those dealing with the Cougar, by W. A. Perry, and the Lynx, by J. C. Nattrass; Mr. Lett's paper on the Caribou; and Mr. Cooper's monograph of the Wolverine. Altogether, the volume is an important contribution to the natural history of the big game of North America.

Thompson, Edward H.—Explorations at Labua, Yucatan. Abstract of a Diary presented at the Semi-Annual Meeting of the American Antiquarian Society, April 27, 1887: 8vo., pp. 7, plan.

GENERAL.

Lucas, C. P.—A Historical Geography of the British Colonies. Vol. ii. Oxford, Clarendon Press, 1890: cr. 8vo., pp. 343. Price 7s. 6d. [Presented by the Delegates, Clarendon Press.]

Vol. i. of this work was noticed in the 'Proceedings' for 1889, p. 122. The present volume mainly deals with the West Indian Dependencies of Great Britain. It is divided into three sections—Section I. treats of the Bermudas; Section II. includes a chapter on European Colonisation in the West Indies; others deal with the Bahamas, Jamaica and its Dependencies, the Leeward Islands, Barbados, the Windward Islands, Trinidad and Tobago, British Guiana, and British Honduras. Section III. is devoted to the Falkland Islands and South Georgia. A selected list of books dealing with each dependency is appended in each case. The volume is illustrated with twelve maps and diagrams.

[North Atlantic Ocean.]—Report of Ice and Ice Movements in the North Atlantic Ocean, by Ensign Hugh Rodman, U.S.N. Under the direction of Captain Henry F. Picking, U.S.N., Hydrographer. [U.S. Hydrographic Office Publ., No. 93.] Washington, 1890: 8vo., pp. 26, charts. [Presented by Captain H. F. Picking.]

[Pellow, Thomas.]—The Adventures of Thomas Pellow, of Penryn, Mariner. Written by himself, and edited, with an Introduction and Notes, by Dr. Robert Brown. London, T. Fisher Unwin, 1890: 8vo., pp. 379, illustrations. Price 5s. [Presented by the Publisher.]

This forms volume iv. of the "Adventure Series," now in course of publication. It consists of a reprint of the curious narrative of Thomas Pellow, first issued in 1740, under the title of 'The History of the Long Captivity and Adventures of Thomas Pellow in South Barbary. Giving an Account of his being taken by two Saltee Rovers, and carry'd a Slave to Mequinez, at Eleven Years of Age: His various Adventures in that Country for the Space of Twenty-three Years: Escape, and Return Home,' &c., &c. Some valuable geographical information will be found scattered throughout the volume, Pellow having visited many parts of the country for the first time; his accounts of the manners and customs of the Moors are also of interest. Dr. Brown has supplemented his volume with a series of notes which throw light upon certain obscure passages occurring in the narrative. Altogether, the book may be said to give a fairly accurate picture of Morocco between 1715 and 1733.

Philipof, N. M.—*Zapiski Imperatorskago Russkago geographicheskago obshestva.* Tom. xx. No. 2., St. Petersburg, 1890: pp. 112. *Memoirs of the Russian Geographical Society. General Geography, vol. xx. No. 2.*

Contains a treatise, illustrated by diagrams, on the change in level of the Caspian Sea. Various explanations have been given of the phenomenon. Some have attributed it to a conjectural subterranean channel connecting the Caspian with the Persian Gulf; others have propounded the theory of a huge vortex in Karabugaz Gulf, in the centre of which the waters disappeared; a more recent suggestion was that of numerous submarine volcanoes drawing the water into their depths and again ejecting it. Doubts have even been expressed as to whether there have been alternations in the level, and it has been found necessary to verify old observations and establish fresh marks in order to show what changes have actually taken place and what are still proceeding.

Among the inquirers who have studied the subject in past times, the well-known names of Pallas, Alexander von Humboldt, Lenz, Abich, Baer, and Khanikof are cited. All these have attempted to explain the phenomenon, though not in a wholly satisfactory way. Lenz in 1830 and Khanikof in 1853 cut marks in the rocks on the island of Nargen and near Baku to serve as standard data. Khanikof studied the history of the subject and deduced the following facts. In early days, about the first century of our era, the level of this sea stood at 85 feet above its present horizon, when it spread over a vastly more extensive area than now. Since then, a general and gradual decline took place. During the 18th century, however, there appear to have been two periods when the level rose, if we may rely on the accounts of Hanway, Woodruffe, Tatistchev and other travellers. From the beginning of the present century there has been a fall, but since 1865, judging from recent more accurate observations, the level has been higher.

Khanikof rendered good service by first inaugurating an era of more exact knowledge of the changes taking place, while Lenz, who reviewed the whole subject in his admirable article "Ueber das Niveau des Caspischen Meeres," is entitled to the credit of having first placed marks representing the normal height of the sea. Lieut. Sokolof, a naval officer, while working in the Caspian from 1843 to 1848, collected a vast mass of information partly based on his own observations. He found that in the present century the level had steadily fallen, just as in the last century it had steadily risen, causing serious apprehensions among the inhabitants of an inundation, and giving rise to the belief in secular variations every thirteen years. Lerch, while in Baku in 1734 and 1747, found submerged buildings which had stood on dry land thirty years before, and in his description of the bay of Enzeli near Resht, he mentions a saying of the Persians, that the sea rose and fell alternately every thirty years, a statement the improbability of which has been demonstrated.

The present author, M. Philipof, who took part in the hydrographical survey of the Caspian under the orders of Ivashintsef, has made a special study of the whole question by the light of recent more accurate data. Inquiring into the causes of these changes, he finds a variety of influences at work, such as wind driving the water towards certain coasts, temperature of the air causing in summer evaporation and consequent fall in level, and in winter, cold producing the reverse effect or a rise in level. Rivers, rain, and earthquakes are also among the active agencies causing fluctuations from month to month and from day to day. It is interesting to learn from M. Philipof's pamphlet that the Russian Government are turning their attention to these researches, and have commissioned the well-known meteorologist M. A. Rykachof to place marks and record observations, so that in future there should be no lack of positive facts to take the place of uncertain theories.—[E. D. M.]

Shaler, N. S.—*Aspects of the Earth; a Popular Account of some familiar Geological Phenomena.* Illustrated. London, Smith, Elder, & Co., 1890: 8vo., pp. xix. and 344. Price 16s.

Most of the chapters in this volume were originally contributed to 'Scribner's Magazine.' These were however written with a distinct purpose and have a

certain common quality. They are intended to give the general reader, unacquainted with the details of natural science, a comprehensible account of some of the more interesting series of the actions which affect the surface of the earth. The work is thus really a series of papers in physiography, and as such, with Professor Shaler's careful and interesting treatment, it will be found to contain much that will prove suggestive to the young student of geography. Such subjects are dealt with as the stability of the earth; volcanoes; caverns and cavern life; rivers and valleys; the instability of the atmosphere; forests of North America; the origin and nature of soils. The many illustrations (including, of course, the cañon of the Colorado) are all appropriate, and the execution is in the beautiful style so familiar to the readers of American magazines.

Smith, George.—A Modern Apostle, Alexander N. Somerville, D.D., 1813-1889, in Glasgow, Scotland, and Ireland; India and America; Australasia and Austral-Africa; Spain, France, and Italy; Germany and Russia; Greece and Turkey; Austro-Hungary and Slavonia. London, John Murray, 1890: 8vo., pp. ix. and 423, map, portrait, and illustrations. Price 9s. [Presented by the Author.]

[**Voyage of the "Gazelle."**—Die Forschungsreise S.M.S. "Gazelle" in den Jahren 1874 bis 1876, unter Kommando des Kapitäns zur See Freiherrn von Schleinitz, herausgegeben von dem Hydrographischen Amt des Reichs-Marine-Amts. 5 vols. I. Theil. Der Reisebericht (maps and plates); II. Theil. Physik und Chemie (map and diagrams); III. Theil. Zoologie und Geologie (plates); IV. Theil. Botanik (plates); V. Theil. Meteorologie. Berlin, Ernst Siegfried Mittler u. Sohn; 4to., pp. (vol. i. 1889) x. and 307; (vol. ii. 1888) 265; (vol. iii. 1889) vi. and 322; (vol. iv. 1889), xvi. 58, 16, 48, 64, 20, and 49; (vol. v. 1890) 282.

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Indian Atlas, Quarter sheet, 50 S.E. Parts of District Agra (N.W. Provinces), Gwalior State (C.I. Agency), Bhurtpore, Ulwur, Dholpur, Kerowlee, and Jeypore States (Rajputana Agency), September 1889, 4 miles to an inch.—India, 1883, additions to Railways, January 1890, 64 miles to an inch. 4 sheets.—Telegraph Map of India, 1889, 32 miles to an inch. 6 sheets.—Railway Map of India, corrected up to January 1890 (second edition), 32 miles to an inch. 6 sheets.—Skeleton Railway Map of India, 48 miles to an inch. Railways up to January 1890 (second edition). 4 sheets.—Skeleton Railway Map of India, 64 miles to an inch. July 1890. 2 sheets.—Map of Punjab, 1884. With additions to Boundaries and Railways, March 1890, 16 miles to an inch. 4 sheets.—District Gya. Lower Provinces, Behar (Bengal). Scale 4 miles to an inch. Taken from sheets Nos. 103, 104, 112, and 113 of the Atlas of India. Corrections to September 1889.—District Jaunpur, 1877 to 81, 2 miles to an inch. 3 sheets. Published 1890.—District Ballia, 1880 to 83, 2 miles to an inch. 2 sheets. Published 1890.—Map of the District of Budann. Compiled from sheets of the New Revenue Survey, surveyed under the superintendence of Colonels J. E. Castrell, r.e.g.s., and D. C. Vanrenen, r.a., Superintendents of Revenue Surveys, in Seasons 1865-66, 72-73-74-76, 77, and 78. 2 sheets. 2 miles to an inch.—District Bijnor. 1868 to 70. 2 miles to an inch. Published 1890. 4 sheets.—Dacca Division, comprising the Districts of Furreedpore, Backergunge, Dacca, and Mymensingh, 8 miles to an inch. Published 1890.—Mysore, 16 miles to an inch. 1888. With additions to 1890.—Bengal Survey, 1 mile to an inch. Season 1878-79. Sheets Nos. 194 and 195, District Cuttack. No. 344, Districts Mymensingh, Rungpore, and Bogra. Seasons 1853-54 and 1855-57.—Bombay Survey, 1 mile to an inch. Sheet No. 123 (second edition), Parts of Ahmedabad and Kaira Districts (Gujarat). Seasons 1871 to 73 and 1884-85. Sheet No. 204, Districts Satara, Ratnagiri, and Kolhapur and Southern Maratha Agency. Seasons 1883-84-85-86. No. 306, Districts Belgaum and Dharwar, Sangli and Ramdurg States. Season 1886-87.—Punjab Survey, 1 mile to an inch. Seasons 1885 to 88. Sheet No. 225, District Ferozepore and Faridkot State. No. 226, District Ferozepore. No. 249 (preliminary edition), Districts Jullundur, Hoshiapur, Gurdaspur, and Kapurthala State. No. 253 (preliminary edition), District Ludhiana and Sikh States.—North-West Provinces and Oudh Survey, 1 inch to a mile. No. 23, Districts Aligarh and Muttra and Bhurtpur State. Seasons 1872 to 74 and 1883-84. No. 52, Districts Aligarh, Etah, and Budaun. Seasons 1876 to 78 and 1882 to 84. No. 58, Parts of District Jhansi (N.W. Provinces) and of Orchha Native State (C.I. Agency). Season 1856-57. No. 184, District Mirzapur. Seasons 1881 to 83 and 85-86. No. 212, District Mirzapur. Seasons 1882-83 and 86-87.—Assam Survey, 1 inch to a mile. Sheet No. 39 (preliminary edition). Districts Kamrup and Darrang. Seasons 1883 to 87.—Central India and Rajputana Survey, 1 inch to a mile. Sheet No. 77. Parts of the Palanpur and Rajputana Agencies, and of the Deesa Cantonment. Season 1887-88. No. 178, Parts of Rajputana and Central India Agencies, and of District Panch Mahals and Rewa Kantha Agency (Bombay). Seasons 1884-85-86.—Sheet No. 179, Parts of Central India Agency and of District Panch Mahals

and Rewa Kantha Agency (Bombay). Seasons 1884-85-86.—Oudh Revenue Survey, 1 inch to a mile. Sheet No. 162, Districts Fyzabad and Gonda. Seasons 1864-65 and 68-70. Sheet No. 175, District Gonda. Season 1869-70.—North Eastern Frontier, 1 inch to 8 miles. Sheet No. 14, Parts of Districts Lakhimpur, Sibsagar, Naga Hills, Naga Tribes (Assam), and of Singpho-Naga Hills.—South Eastern Frontier, 1 inch to 4 miles. Sheet No. 2 N.E. (fifth edition), Parts of Districts Lower Chindwin, Sagaing, Myingyan, Pekokku, and Meiktila (Upper Burma). Season 1886 to 89.—South Eastern Frontier, 1 inch to 8 miles. Sheet 1 (preliminary), second edition, Parts of the Lushai and Chin Hills, and the Districts of Upper and Lower Chindwin, Katha, Shwebo, Yeu, Pakokku, and Sagaing (Upper Burma); of the Arakan Hill Tracks (Lower Burma); of the Chittagong District and Hill Tracts, and Hill Tipperah (Bengal). No. 3 (preliminary), Parts of Districts Minbu, Magwe, and Pyinmana (Upper Burma) and Akyab, Kyankpyu, Thayetmyo, Toungoo, Sandoway, Prome, Henzada, Tharrawaddy, and Shwegyin (Lower Burma).—Lower Burma Survey, 1 inch to a mile. Sheet No. 142, District Bassein. Season 1879-80. Sheet No. 187, District Bassein. Season 1880-81-82. Sheet No. 234, District Hanthawaddy. Season 1881-82.—Andaman Islands, 1 inch to 4 miles. Sheets Nos. 1, 2, 9, and 10. Seasons 1883-1886.—Reconnaissance of road between Fort Lungleh and Fort Haka, 1 inch to 2 miles. To accompany report by Major H. P. Leach, R.E., 1889-90 Levels in the Punjab. Sheet No. 81. Second edition. Parts of Ferozepore, Sirsa, Patiala, Nabha, Montgomery, Bahawalpur, and Bickaneer, 1 inch to 2 miles. 1888. No. 83. Second edition. Parts of Lahore, Ferozepore, and Amritsar.—Index Chart to the Great Trigonometrical Survey of India. Completed to 1st October 1889, 1 inch to 96 miles.—Chart of Triangulation and Traversing. Gujarat Survey, 1 inch to 2 miles. 1890.—Baluchistan Survey. Chart of Triangulation, 4 miles to an inch. Sheets Nos. 101 and 102. Season 1886-87. Preliminary Chart of Secondary Triangulation by J. H. O'Donel, Esq. District Akyab, 1856-61, 1 inch to 4 miles, 2 sheets.—Index to the Standard Sheets and Published Maps of the Province of Assam, 1 inch to 48 miles, 1889.

(Stanford, Agent.)

AFRICA.

Afrika.—Neueste Karte von —. Scale 1 : 7,500,000 or 101 geographical miles to an inch. Ausgeführt in der Kartographische Anstalt von J. Mann. 4 Blätter. Stuttgart, Maier. Price 4s. (*Dulau.*)

Afrique.—Carte de l'—. Scale 1 : 2,000,000 or 27 geographical miles to an inch. Dressé et dessiné par le Chef de Bon. du Génie Regnaud de Lannoy de Bissy. Publié par le Service Géographique de l'Armée en 1890. Sheets No. 25, Sokoto. No. 33, Benin, with hill shading. Price 6d. each sheet. (*Dulau.*)

Sheet 25 includes the country between latitudes 7° 20' N. and 14° 20' N.; and longitudes 2° 20' and 11° 20' E. of Paris. It has been compiled from the latest materials, and gives the routes of many well-known travellers. Sheet 33 includes the coast from Cape Coast Castle to the eastern part of the Niger Delta. Three insets are given of the islands of St. Thomas, Prince's and Anno Bom.

Junker, Dr. Wm.—Reiseroute durch Bunyoro und Buganda. Januar bis Juni 1886. Nach dem Tagebuch construiert von Dr. B. Hassenstein. Scale 1 : 500,000 or 6·8 geographical miles to an inch. Petermann's 'Geographische Mitteilungen,' Jahrgang 1891, Tafel 1. Gotha, Justus Perthes. (*Dulau.*)

South African Republic.—Postkaart van de Zuid Afrikaansche Republiek uitgegeven door den Postmeester generaal. Pretoria, Januari 1890. Geteekend door Paul C. Paff, Ambtenaar Telegraaf Department. Gedrukt en gelithografiëerd door de Digger's News Co., Johannesburg.

AUSTRALIA.

Queensland.—Map of —, illustrating the Counties. Compiled from Official Maps. Scale 1:2,920,000 or 40 geographical miles to an inch. Surveyor-General's Office, Brisbane, 1890.

— Brisbane and Surrounding Country. (Moreton 40 chain Map.) Scale 40 chains to an inch. Surveyor-General's Office, Brisbane, 1889.

— Plan of the Suburbs of Brisbane. Scale 10 chains to an inch. Surveyor-General's Office, Brisbane, 1890.

— Plan of the City of Brisbane and Suburbs, according to the original Crown Grants. Scale 8 chains to an inch. Surveyor-General's Office, Brisbane, 1890.

— Plan of Townsville. Scale 6 chains to an inch. Surveyor-General's Office, Brisbane, 1890.

PACIFIC OCEAN ISLANDS.

Zöller, Hugo.—Skizze der Buka-Strasse (Deutsche Salomon Inseln) aufgenommen an Bord des Neuguinea-Dampfers "Ysabel", von Hugo Zöller. Scale 1:350,000 or

CHARTS.

Admiralty.—Charts and Plans published by the Hydrographic Department, Admiralty, in November and December 1890.

No.		Inches.	
1564	m =	4·0	England, south coast:—Whitsand Bay, 1s. 6d.
1391	{ m = m =	{ 4·0 7·0	Spain, east coast:—Meda islands anchorage. Tossa anchorage. San Feliu de Guixols anchorage. Palamos anchorage. Blanes bay. Lloret bay, 1s. 6d.
1213	m =	0·8	Canada, lake Huron:—Collins inlet to M'Coy islands (plans, Alexander inlet. French river. Pt. au Baril harbour), 2s.
1507	m =	1·8	Canada, lake Huron:—St. Joseph channel, 1s. 6d.
1427	m =	3·0	United States, Washington territory:—Seattle harbour. Tacoma harbour, 1s. 6d.
1425	m =	0·24	Bay of Bengal, Orissa coast:—Gopalpur to False Point (plans, Gopalpur. Puri), 2s. 6d.
1419	m =	0·75	Bay of Bengal, Andaman islands:—Long island to port Blair, 2s. 6d.
1593	m =	5·0	Borneo, east coast:—Silam harbour, 1s.
1962	m =	0·24	China, south-east coast:—Hongkong to the Brothers (plans, Ty-sami. Goat island anchorage. Owick bay), 3s.
1560	m =	2·5	Korea, south coast:—Mado inlet and Long reach, 2s.
1558	m =	2·5	Korea, south coast:—Crichton Harbour, 1s. 6d.
184	m =	various.	South Pacific Ocean, Phoenix group:—Canton island, Canton island anchorage, Enderbury island, Phoenix island, M'Kean island, Birnie island, Gardner or Kemins island, Hull island, Sydney island, Sydney island anchorage. 2s. 6d.
357	Harbours in Kii channel:—New plan, Komatsushima anchorage. (J. D. Potter, Agent.)		

CHARTS CANCELLED.

No.	Cancelled by	No.
1350 Ports on the east coast of Spain ..	{ New sheet, anchorages on the east coast of Spain	1391
1351 Plan of Palamos on this sheet ..		
1894 Canary islands	{ Extended chart, Santa Cruz to cape Bojador	1229
1962 Hong Kong to Chelang point ..		
1963 Chelang point to Chauan bay ..	{ New chart, Hong Kong to the Brothers	1962
1022 Plans, Canton island, Canton island anchorage, Hull island, Phoenix island, Birnie island on this sheet		
979 Plan, Enderbury island on this sheet	{ New plans on	184
445 a, b. Inland water communication between Lagos, Badagri, Novo, and Epeh. 2 sheets.		
1107 Plan, Otea Vanua on this sheet.		
357 Plan, Wadasima harbour on this sheet.		

CHARTS THAT HAVE RECEIVED IMPORTANT CORRECTIONS.

No. 1895. England, south coast:—Dungeness to the Thames. 2132. Scotland, Firth of Clyde:—Toward point to Whitefarland point. 2694. France, west coast:—Channels between Ile d'Ouessant and the mainland. 2556. France, north coast:—Calais road. 300. Newfoundland, south coast:—Devil bay to Knife bay. 302. Newfoundland, south coast:—Knife bay to cape Anguille. 332. North America:—Lake Erie. 2890. North America, east coast:—Nantucket shoals to Block island. 2754. North America, east coast:—Long island sound (eastern part). 1917. North America, west coast:—Vancouver island. 1229. Africa, west coast, sheet iii.:—Santa Cruz to cape Bojador. 1107. South Pacific Ocean:—Anchorage in the Society Islands. 648. Africa, east coast:—Delagoa bay to river Zambesi. 842. Bay of Bengal:—Sayer islands and adjacent coast. 357. Japan:—Harbours in Kii channel. 624. Australia, south coast:—Hobson bay and Yarra river. 2591. New Zealand, Middle island:—River Waiau to cape Foulwind.

(J. D. Potter, Agent.)

United States Charts.—Pilot Charts of the North Atlantic Ocean for December 1890 and January 1891. With a supplement showing the Ice in the North Atlantic, season of 1889–90. Published at the Hydrographic Office, Navy Department, Washington D.C. Richardson Clover, Lieut. U.S.N., Acting Hydrographer.

ATLASES.

Stieler's Hand-Atlas.—Neue Lieferungs-Ausgabe von ——. 95 Karten in Kupferdruck und Handkolorit, herausgegeben von Prof. Dr. Herm. Berghaus, Carl Vogel und Herm. Habenicht. Erscheint in 32 Lieferungen (jede mit 3 Karten, die letzte mit 2 Karten und Titel). Siebenundzwanzigste (27) Lieferung. Sheets:—No. 9, Deutsches Reich, Niederlande, Belgien und Schweiz. No. 62, Chinesisches Reich. No. 61, Inner-Asien und Indien, Südliches Blatt. Justus Perthes, Gotha, 1890. Price 1s. 6d. each part. (Dulau.)

Sheet No. 9 includes the whole of Germany, Holland, Belgium, and Switzerland and is therefore drawn on small scale; it also contains a plan of Berlin and its environs on an enlarged scale, and a list of the States which compose the German Empire. No. 61 is the southern portion of a two-sheet

map of Central Asia and India, on which the heights of mountains are given in metres, and the depths of the ocean are indicated by contour lines from 200 to 3000 metres. A table is given of the provinces and divisions of British India, each of which has a number corresponding to it on the map. All railways and main roads have been laid down, it is not overcrowded with names, and is a very carefully prepared and well-drawn map. Sheet 62 is a map of the Chinese Empire, on which an inset plan of Pekin and its environs is given. All the treaty ports are underlined with red, and the country of the independent hill tribes is indicated. These maps, like the others belonging to this atlas, are excellent specimens of cartography.

Vidal-Lablache, M.—*Histoire et Géographie*. 137 Cartes. 248 Cartons. Atlas Vidal-Lablache, Maître de Conférences de Géographie à l'École Normale Supérieure. (L'Atlas complet paraîtra en 24 livraisons.) Paris, Armand Colin & Cie. Editeurs. 1re Livraison. Price 6*d.* (The price of the other parts will be 1*s.* 2*d.*) (*Dulau.*)

This is the first issue of a Historical and Geographical Atlas which, when completed, will contain 137 principal maps and 248 insets. The part under notice consists of the following maps:—Ancient Italy (southern part) on which insets of Campania, maritime portion, and Italy under Augustus are given; Roman Conquests, on which a part of Peutinger's Table is shown; and Gaul in the time of Cæsar, with an inset of Alesia 52 B.C. The remaining three maps are geographical, and consist of a physical map of Spain and Portugal, with a small Mercator's projection of the world on which the positions of Spanish and Portuguese colonies are indicated, and insets of the Balearic Isles, and Lisbon and its environs. A map of Switzerland, with eight insets; and a physical map of Italy, with five insets.

At the foot of each sheet some well-written explanatory notes are given, and great pains have evidently been taken to make this atlas as complete as its size and the scale of the maps will permit.

PHOTOGRAPHS.

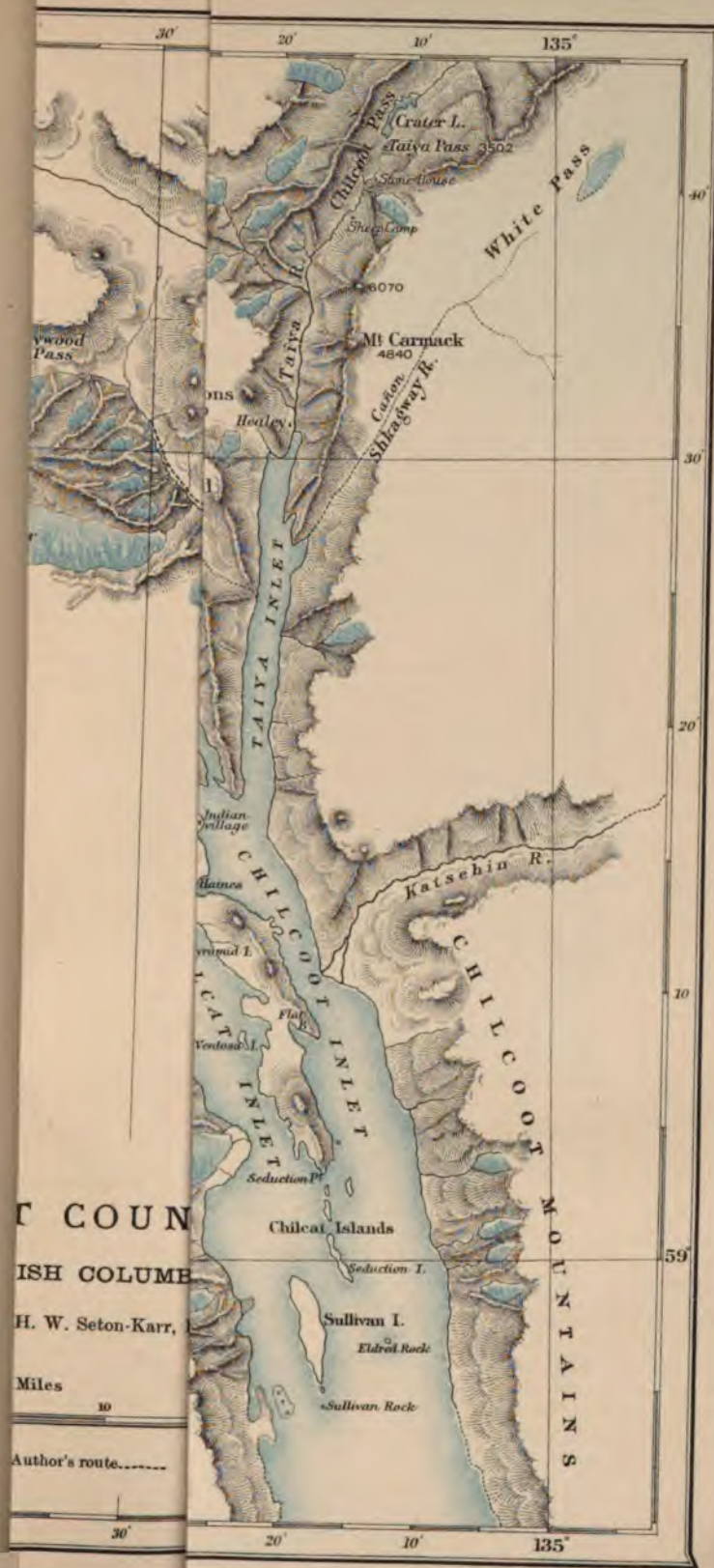
Etna, Mt.—Album of Photographs of —, taken by Prof. Émile Chaix, 1890, and presented by him to the Royal Geographical Society.

This album contains nineteen photographs taken by Professor Émile Chaix during his two months' exploration of Mount Etna. They have been well chosen to illustrate physical features, and Professor Chaix has added to their value by the notes which he has given at the bottom of each photograph.

Kashmir and Ladak.—Forty-four photographs of —, taken by Captain A. F. Mockler-Ferryman, Oxfordshire Light Infantry, and presented by him to the Royal Geographical Society.

This is an excellent series of forty-four photographs taken by Captain A. F. Mockler-Ferryman when on a shooting trip in Ladak, and presented by him to the Map Room collection. Nearly all of them are remarkably good photographs. That such good results have been obtained, notwithstanding the fact that Captain Mockler-Ferryman was unable to do any developing until he had carried the plates about for nearly a thousand miles on pack animals among the Himalayas, should encourage travellers to take photographic cameras with them, even though the country they are about to visit may be extremely rough, and the prospect of having to carry their undeveloped plates for a great distance certain.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. When purchased photographs are presented, it will be useful for reference if the name of the photographer and his address are given.





PROCEEDINGS
OF THE
ROYAL GEOGRAPHICAL SOCIETY
AND MONTHLY RECORD OF GEOGRAPHY.

The Meteorological Results of the 'Challenger' Expedition in relation to Physical Geography.

By ALEXANDER BUCHAN, M.A., LL.D., Secretary of the Scottish Meteorological Society.

(Read January 19th, 1891.)

Maps, p. 192.

TWENTY-ONE years ago, I received a letter from Sir Roderick I. Murchison, inviting me to read a paper to the Geographical Section of the British Association at Liverpool, of which section Sir Roderick was President that year, on the mean pressure and prevailing winds of the atmosphere, giving to the meeting a *résumé* of the results of the discussion of these questions which had just then been published. This was done, and immediately thereafter, the Royal Geographical Society adopted, in carrying out one of the important branches of the Society's work, one of the results of this discussion, viz. a more exact method of determining heights from barometric and thermometric observations. Previously to this time, these heights had been determined, as regards newly explored and little-known regions, by assuming a pressure of 30 inches for all localities and seasons, instead of the approximate sea-level pressure of the locality whose height was to be calculated, and for the season of the year for which observations for the purpose were available.

Other large questions, both practical and scientific, affecting the general movements of the atmosphere and of oceanic circulation, and questions dependent on these movements, began to be discussed with greater frequency and fulness, particularly in their relations to physical geography.

But a serious desideratum soon came to be felt by all workers in this department of science. It was thrust obtrusively on the attention, that discussions on the more fundamental problems of meteorology, relative to the diurnal and seasonal changes in atmospheric temperature, pressure, humidity, and wind, were really restricted to observations made on land. It was plain that data supplied exclusively by obser-

vations on land, which occupies but little more than a fourth part of the earth's surface, were altogether inadequate to a right conception and explanation of atmospherical phenomena. Accordingly, when the *Challenger* expedition was fitted out in 1872, arrangements were made for taking, during the cruise, hourly or two-hourly observations both of the atmosphere and of the surface temperature of the sea.

As you are well aware, in addition to these frequent daily observations, elaborate observations were made of sea temperatures at all depths, which gave results at once recognised to be of the first importance in terrestrial physics, inasmuch as they opened up for discussion the broad question of oceanic circulation on a sound basis of well-ascertained facts. But a right understanding of this subject demands, as an imperative preliminary, a full discussion of atmospheric phenomena. For example, one of the first requisites is an approximately correct representation of the circulation of the atmosphere on the surface of the globe in all seasons of the year. Now this can really only be attained from the geographical distribution of the mass of the earth's atmosphere, as shown by the mean monthly isobars; and these, in their turn, ultimately depend on the geographical distribution of the temperature and humidity of the atmosphere.

It is thus abundantly plain that any such discussion requires, if it is to be handled aright, maps showing for the various months of the year the mean temperature, mean pressure, and prevailing winds of the globe, with carefully prepared and extensive tables of the observational data required for the graphic representation of the results. Now the only works then available were Dove's isothermals, 1852; Buchan's isobars and prevailing winds, 1869; and Coffin and Wojekof's winds of the globe, 1875—all of which were based necessarily, when written, on defective data. A re-discussion, therefore, of all the available information regarding the different atmospheric phenomena, with a more special reference to the *Challenger* observations, was most desirable. This discussion I was asked to undertake, and after seven years' unremitting labour, and with such assistance as I could command, the report was published a year ago.

This report gives, in addition to the results proper of the *Challenger* observations, the mean diurnal variation of atmospheric pressure at 147 stations in all parts of the globe; the mean monthly and annual pressure at 1366 stations, and a similar table of mean temperatures at 1620 stations; and the mean monthly and annual direction of the wind at 746 stations. As regards the winds, other data have been utilised, which have been published with, or from, actual observations by the meteorological departments of the United States, England, France, Holland, Germany, Norway, Denmark, Italy, Mauritius, and India. In no case, as regards the all-important factor of the wind, has any wind been indicated on any one of the twenty-four maps showing the

prevailing winds, which does not rest on the authority of observed facts.

Fifty-two large folding maps accompany the report, of which twenty-six show by isothermals the mean monthly and annual temperature on hypsobathymetric maps, or maps showing by shadings the height of the land and depth of the sea, first on Gall's projection, and second on north circumpolar maps on equal surface projection; and another set of twenty-six maps showing by isobars for each month and the year the mean pressure of the atmosphere, the gravity correction to lat. 45° being applied, and by arrows the prevailing winds of the globe. These data, thus elaborately and, it may be said, exhaustively represented, may be regarded as comprising all information at present existing which is required for the discussion of the broad questions dealt with in the report.

To the revolution of the earth on its axis we owe day and night; to the inclination of the earth's axis to the plane of its orbit we owe the alternation of seasons; and to its diversified surface of land and water we owe the infinite variations of climate which characterise its different regions. It is with the last of these we have here to deal. As the atmosphere everywhere overlies the land and water surfaces of the globe, and is influenced in an all-powerful manner by its simple superposition over these very different surfaces, it follows that the science of meteorology rests on the basis of physical geography. The relations of the two sciences are in truth of a greatly more intimate nature than is generally supposed.

When it is considered that three-fourths of the earth's surface is water, that the temperature of the air resting on its surface is in closest relation to the temperature of that surface, and that the latter has, through the winds, direct and all-important bearings on the temperature of the land surfaces of the globe, it is plain that it is impossible to overstate the importance of the temperature of the sea as a fundamental datum in meteorology. Steps were therefore taken to make, during the cruise, observations of sea temperatures in a manner and with a fulness not previously attempted.

Observations on the temperature of the surface were made every two hours of the day as part of the scientific work of the expedition. From 1512 observations made in the North Atlantic, the mean latitude being 30° and longitude 42° , it is conclusively shown that the daily change of the temperature of the surface of this ocean is only $0^{\circ}\cdot8$. Similarly in the South Atlantic, lat. 33° and long. 20° W., it was $0^{\circ}\cdot8$; in the North Pacific, lat. 37° and long. 170° W., it was $1^{\circ}\cdot0$; and in the South Pacific, lat. 36° and long. 87° W., it was $0^{\circ}\cdot9$. In the equatorial portions of the Atlantic and Pacific the daily variation was $0^{\circ}\cdot7$; and in the higher latitudes of the Southern Ocean it was only $0^{\circ}\cdot2$. Hence, in the great oceans away from land, and between lat. 40° N. and 40° S., the

surface temperature nowhere shows a daily variation exceeding a degree Fahrenheit. Near the equator the daily range falls to three-fourths of a degree, and still further to one-fifth of a degree in high latitudes. The small daily variation of the temperature of the surface of the sea, shown by the *Challenger* observations, is unquestionably a most important contribution to physical science, forming, in truth, one of the prime factors in meteorology and physical geography.

Observations of the temperature of the air were made with the same frequency, with the general result that the daily range of the temperature of the air over the open sea is from three to four times greater than that of the surface of the sea over which it lies. The point is one of no little interest in atmospheric physics, from its important bearings on the relations of the air and its aqueous vapour, in its gaseous, liquid, and solid states, and of the particles of dust everywhere present, to solar and terrestrial radiation. During the seventy-six days the *Challenger* was not on the open sea, but near land, the hour of occurrence of the maximum temperature was as early in the day as noon, owing probably to the diurnal period of the sea breezes; and the amount of the daily range of temperature was considerably in excess of what is seen to occur over the open sea. Eighteen days' observations in the Southern Ocean about lat. 63° showed a mean daily range of the temperature of the air of $0^{\circ}\cdot8$, being also about four times greater than that of the sea in the same region.

Over the open sea the humidity curve closely follows that of the temperature, being at the minimum at four in the morning, and at the maximum at two in the afternoon. But near land very different conditions prevail; here a second minimum takes place from about 10 a.m. to 2 p.m.—a feature altogether absent over the open sea. With reference to this midday minimum of the humidity curve, it is to be noted that it is at this time of the day when, the surface of the land being most highly heated, the ascending current of heated air arising from it is strongest, and the resulting breeze from the sea towards the land therefore also strongest. Now this lowering of the elastic force of the vapour of the breeze blowing over the sea towards the land points unmistakably to an intermixture, with the air forming the sea breeze, of descending air filaments or currents, to take the place of the masses of air removed by the currents which rise from the heated surface of the land. Thus, while at this time of the day ascending air currents arise over the land, descending air currents, with their characteristic greater dryness, set in over the adjoining ocean at some little distance to windward.*

Over the open sea the diurnal oscillations of the barometer are shown in their simplest and exactest form, the disturbing influence of land being wholly wanting. The remarkable result is this, though the

* This furnishes the explanation of the apparently erratic movements of the balloon referred to by Captain Toynebee at the meeting, p. 157.

atmosphere there overlying the ocean, and, therefore, resting on a floor whose diurnal variation of temperature does not exceed a degree Fahrenheit, yet the diurnal oscillations of the barometer are as marked, and as decided as they are over the land where the diurnal variation of temperature is great. In accounting, therefore, for these oscillations, it is virtually unnecessary to take the temperature of the surface into consideration. What is insisted on here is that while the temperature of the surface leaves its impress on the diurnal barometric curve by important modifications thereby produced, yet the barometric oscillations themselves are independent of the temperature of the earth's surface. Hence the cause must be sought in the daily changes which take place in the temperature and humidity of the air through all its height, due to solar and terrestrial radiation.

Another important result, the *Challenger* observations have revealed, is that over the ocean, latitude for latitude, the amplitude of the barometric oscillations is larger in an atmosphere highly charged with aqueous vapour, and less in a dry atmosphere. Thus in the four anticyclonic regions of the Pacific and Atlantic, lying about lat. 36° N. and S., immediately to westward of the adjoining continents, the amount of the diurnal barometric oscillation from the morning maximum to the afternoon minimum is only about 0.025 inch, falling in summer in the anticyclonic region of the North Atlantic to 0.014 inch. Now these anticyclonic regions of the great oceans are characterised by calms, light and variable winds, and further they are little traversed by seamen, as shown by Baillie's Meteorological Charts of the ocean. These regions are shown on the accompanying isobaric charts, Plates III. and IV., where it will be seen that the surface winds outflow in every direction from the high pressure areas of the anticyclones. Since, notwithstanding the outflow from the surface, pressure remains high, it necessarily follows that the high pressure is kept up by an inflow of upper currents. As the slow descending air of the central spaces of the anticyclones connects the inflowing upper currents with the outflowing winds of the surface, it follows that the air filling the central areas of the anticyclones is relatively very dry, because every stage of the descent, increasing the pressure, thereby increases at the same time the temperature and the dryness. Hence, over anticyclonic areas, the atmosphere is less cooled by nocturnal radiation and less heated by solar radiation, and the change of the aqueous vapour from the gaseous to the liquid state, and *vice versa*, is also greatly less than elsewhere.

The all-important bearing of these anticyclonic areas on physical geography will be shown farther on, when it will be seen that to them exclusively belongs the relegation of large portions of the earth's surface to climates which result in practically rainless deserts on the one hand, and on the other to rains generous but genial in amount, and in certain

regions so torrential in violence and persistency as to lay an arrest on many important industrial pursuits.

In certain situations the diurnal barometric curve exhibits a unique phase of character, which is attended with results of considerable interest to the physical geographer. Such is the barometric curve peculiar to deep valleys, of which the curves of Gries and Klagenfurt in the Alps may be cited as illustrations. In such situations, the whole surface of the region during night is cooled by radiation below the air above it, and the air in immediate contact with the ground becoming also cool, a system of descending air-currents sets in over the whole face of the country bounding the deep valley. The direction and velocity of these currents are modified by the irregularities of the ground, and, like currents of water, they converge in the bottom of the valleys, which they fill to a considerable height with the cold air they bring down the sides of the mountains. This cold and relatively dense air rises above the barometers which happen to be down in the valley, with the result that a high mean pressure is maintained during the night. In summer pressure is maintained at the coldest time of the night, 0.040 inch at Gries higher than in open situations in that country. On the other hand, during day these deep valleys become highly heated by the sun, and thus a strong ascending current is early formed, under which the barometer falls unusually low. At Gries it falls in the afternoon 0.030 inch lower than in open situations in that part of Europe. One of the many results of this abnormal distribution of the daily pressure of the atmosphere is this, that if it were attempted to use the barometric observations of Gries in determining the heights of the surrounding mountains, the height calculated from observation at 4 p.m. would be 70 feet lower than from the 4 a.m. observations. Similarly, even in two such situations in the valley of the Thames as Greenwich and Kew, the height of Greenwich above Kew would, if determined barometrically, vary six feet accordingly as calculated from observations early in the afternoon, or in the early morning in summer, in which season, owing to the larger diurnal range of temperature, the calculated differences are greatest.

It will be shown further on that there is not only an abnormal distribution of pressure as shown by the diurnal barometric curves according as the effects of solar and terrestrial radiation are practically confined to and accumulate in these valleys; but even as regards the mean annual distribution of pressure through the months of the year, substantially the same accumulations and removals of large portions of the mass of the earth's atmosphere go on, according as either solar or terrestrial radiation is in excess at that season of the year. Hence in preparing the climatological maps for the *Challenger* Report, no observations made in such situations were used.

During the cruise, observations were made on the force of the wind on 1202 days, at least twelve times daily, 650 of the days being on the open

sea, and 552 near land. The velocity of the wind is shown to be greater over the open sea than near land, the mean difference being from four to five miles an hour. Of the five great oceans, the wind's velocity is greatest over the Southern Ocean and least over the North Pacific, the rates per hour being respectively 23 and 15 miles, the difference being thus 8 miles, caused probably by the winds of the "roaring forties" which were crossed and recrossed by the *Challenger*.

With respect to the open sea, the curves for each ocean show a very small diurnal variation, but a comparison of the five curves shows there is no uniform agreement, the slight variations being different in each case. Indeed it is highly probable that, as the teaching of this large mass of observations, the true diurnal variation in the velocity of the wind is practically a uniform straight line, with the single exception of the slightest rise about midday, not quite amounting to a mile an hour.

On the other hand, as regards the winds observed near land, the velocity at the different hours of the day gives a curve, for the five oceans, as clearly and decidedly marked as the diurnal curve of temperature. The minimum occurs from 2 to 4 a.m., and the maximum from noon to 4 p.m., the absolutely highest being at 2 p.m. The differences between the hours of least and greatest velocity are, for the Southern Ocean, $6\frac{1}{2}$ miles; South Pacific, $4\frac{1}{2}$ miles; South Atlantic, $3\frac{1}{2}$ miles; and the North Atlantic and North Pacific, 3 miles per hour. The higher velocities of the southern hemisphere were doubtless occasioned largely by the persistently low pressure at all seasons in Antarctic regions, and the time of the cruise during which the *Challenger* was within the sphere of that influence.

Over each ocean the velocity of the wind over the open sea is considerably in excess of that near land, and it is particularly to be noted that in no case does the maximum diurnal velocity near land reach the velocity over the open sea. The nearest approach, at any hour of the day, of the maximum velocity near land to the velocity over the open sea is 2.5 miles for the North Atlantic; 3.8 miles for the South Atlantic; 4.6 miles for the North and South Pacific; and 5.1 miles for the Southern Ocean. The difference is greatest at 4 a.m., when it is about six miles an hour, but diminishes as temperature rises, till at 2 p.m. it is a little less than three miles an hour. These facts bring before us, in an impressive manner, the extraordinary effect of the land in reducing, by friction, the velocity of the winds blowing over it; and further, that the heating of the surface of the land by the sun is in some way counteractive of friction.

The observations show that as regards the occurrence of rain over the open sea, there is one maximum of 130 instances at 2 a.m., and one minimum of 95 at 4 p.m.; and that while, for the twelve hours ending 8 a.m., the number of cases was 706, for the twelve hours ending 8 p.m. the number was 635, thus indicating that the occurrence of rain over the open sea is inversely as the temperature. Putting it otherwise, rain

falls more frequently over the sea when the effects of terrestrial radiation are at the daily maximum than when solar radiation is in excess; thus corresponding, as will immediately appear, with the hours of the day when the occurrence of thunderstorms is at the maximum on the ocean.

Of the forty-five thunderstorms recorded during the cruise, twenty-six occurred over the open sea, and nineteen near land. Of those over the open sea, twenty-two occurred during the ten hours from 10 p.m. to 8 a.m., whereas during the other fourteen hours of the day only four occurred. Hence the important conclusion that over the open sea thunderstorms are essentially phenomena of the night, and occur mainly during the time of the morning minimum of pressure. On the other hand, as regards the thunderstorms which were recorded near land, they are pretty evenly distributed during the twenty-four hours, being thus intermediate as regards the hours of their occurrence between the thunderstorms of the ocean and those of the land, whose climates are more or less continental in character. In these climates the time of maximum occurrence is in the early afternoon, or when the barometer is at the afternoon minimum, and the minimum occurrence in the early morning, or when the barometer is at the other minimum of the day—the diurnal phases over the land being thus exactly the reverse of what takes place over the open sea.

Over the open sea the diurnal curve for the occurrence of lightning is on the other hand closely congruent with the evening maximum of pressure; and thus the relations of the maximum of lightning to that of thunderstorms over the open sea are essentially different from what obtains over land. Thus while on land surfaces the maximum of lightning occurs from five to six hours later than that of thunderstorms, it occurs four hours earlier than over the ocean. The order of occurrence of these phenomena in the summer months is thus:—thunderstorms over land 2 to 6 p.m.; lightning over land 8 p.m. to midnight; lightning over the open sea 8 p.m. to 4 a.m.; and thunderstorms over the open sea 10 p.m. to 8 a.m.

If it be assumed—and all observation seems to warrant the assumption—that thunderstorms occur during those abnormal distributions in the atmosphere when temperature falls with height much more rapidly than the normal rate, it follows that on land this abnormal distribution of temperature is brought about by the superheating of the lowermost strata of the air by strong insolation; but over the open sea the abnormal arrangement is brought about by the relatively great cooling of the upper strata by the direct effect of terrestrial radiation. On the other hand, lightning without thunder, or silent lightning, reaches its daily maximum at those hours when the upper atmosphere contains the greatest amount of aqueous vapour in its different forms, thus favouring the occurrence of silent electric discharges, and at the same time furnishing the means of making these discharges better seen.

Of the annually recurring phenomena of the atmosphere, the distribution of atmospheric pressure, temperature, and the prevailing winds of the globe are the most important. In truth, charts showing by isobaric lines the mean pressure of the atmosphere through the months of the year, may be considered as furnishing the key to the more fundamental problems of meteorology, since it is only by the information thereby obtained that questions relating to the prevailing winds, the varying temperature, cloud, and the rainfall of different regions can be satisfactorily handled. Accordingly, fifty-two maps have been constructed from all the data available for the purpose, of which twenty-six show, by isothermals, the mean monthly and annual temperature on hypsobathymetric maps, or maps showing by shading the height of the land and the depth of the sea, first on Gall's projection, and second on north circumpolar maps on equal surface projection; and twenty-six show, by isobars, for each month and the year, the mean pressure of the atmosphere, the gravity correction to latitude 45° being applied, and by arrows the prevailing winds of the globe. The isothermals have been drawn from mean temperatures calculated for 1620 stations, and the isobars from mean pressures from 1366 stations. We reproduce here the maps showing the distribution of temperature for January and July, Plates I. and II.; and the distribution of pressure and the prevailing winds, Plates III. and IV.; and refer to the report itself for fuller details and for a description of the methods adopted in discussing and charting this large mass of material, nearly the whole of which has been prepared expressly for this report. One or two points, however, may be noted.

The correction for the rate of the diminution of temperature with height, or technically the reduction of the temperature observations to sea-level, has been the uniform rate of one degree Fahrenheit for each 270 feet of ascent, as deduced from the observations at the two Ben Nevis observatories, the one at the top and the other at the foot of the mountain. From the horizontal proximity of these two stations and the success with which the local disturbance from the effects of solar and terrestrial radiation have been minimised, the above may be regarded as by far the best data yet available for the determination of this important factor in the physics of the atmosphere.

From the same double set of observations, a vitally important modification has been made, in reducing barometric observations to sea-level, of Laplace's formula, which has necessitated a serious change in the figures for reduction especially in climates such as Africa and Central Asia, where the mean temperature of the months differs greatly from 45° .

But the greatest change has been occasioned by the rigid exclusion from the maps of all observations of temperature and pressure at places situated in valleys, more or less steep and confined, as previously referred to. The result is a considerable change in the representation of

the geographical distribution of temperature, and pressure over particular regions, as hitherto generally given by meteorologists and climatologists. Plates V. and VI., showing the pressure for a large portion of Europe, illustrate this point. On Plate V. the actual mean pressures at sea-level, and corrected to the gravity of lat. 45° , are engraved, the mean pressures at Røros and Tønset in Norway, and at Klagenfurt and Gries in the Alps, being printed in red ink. It is very plain that these red figures stand out as clear exceptions from every surrounding average of atmospheric pressure. The most striking contrast is presented by the means for Tønset and Dovrè, which are respectively 29.95 and 29.87 inches, the two places being nearly the same height, but separated by a broad mountainous range. It will be observed from Plate V. that if the red figures be omitted, mean pressure rises from the west coast of Norway uninterruptedly in every direction on advancing inland into the continent. The higher pressure at Tønset and Røros is simply confined to the lower parts of the deep valleys where these places are situated, and as suggested by the mean pressure at Dovrè adjoining, to no very great heights in these valleys. Probably the extent to which the high pressure obtains in these valleys, would be diagrammatically represented on a map of isobars by no more than a rather broadish stroke of the pen in these valleys.

Plate VI. shows the distribution of the January pressure over this part of Europe as given in Berghaus's recently issued Physical Atlas, where the mean pressures at Tønset and Røros are practically made to overrule the other pressures over the region to east and north-eastward. Similarly, the mean pressures at Klagenfurt and Gries stand equally out as exceptions from neighbouring stations and are worse than useless in drawing the isobars, particularly in the summer and winter months, when the local effects of solar and terrestrial radiation result in marked diminutions and excess of pressure in deep valleys. To these places may be added many others, such as several of the stations in the Caucasus, at Irkutsk and other Siberian stations, and in South America. A similar remark is also applicable in drawing the isothermals.

It also follows that such stations are eminently unsuitable to be used in the barometric determination of heights, it being evident that the heights of the hills between Dovrè and Tønset, if determined from the mean pressures of January, would be 70 feet lower if calculated from the Dovrè observations than they would be if calculated from the observations at Tønset.

In this connection the winds at Røros are remarkably instructive. For the ten years 1879 to 1888, the following are the averages for the month of January.

Days on which the various winds were observed :—

N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.
2	0	1	3	4	1	2	6	12

Hence neither in direction nor force are the winds at Tönset controlled by the lie and proximity to each other of the isobars in this part of Europe; but, with the abnormal pressure, they stand alone. On twelve of the thirty-one days calms prevail, and during the other nineteen days the movement of the air is simply down and up the valley. A considerable outflow from these valleys takes place, resulting from the higher pressure there; and as this higher pressure is maintained from the effects of terrestrial radiation, a character is impressed on the general wind system of this region, which is readily misunderstood and misinterpreted.

Isothermal, isobaric, and wind maps accompany this paper for January and July as the representative months of the seasonal extremes. As January is the time of the year when the sun's heat is least felt, and the effects of terrestrial radiation attain the maximum, the greatest cold occurs over the largest land surfaces in high latitudes. Hence the lowest mean temperature that occurs anywhere or at any season on the globe, $-61^{\circ} \cdot 2$, occurs in January at Werkojansk, lat. $67^{\circ} 34'$ N., and long. $133^{\circ} 51'$ E., in North-eastern Siberia, at a height of 460 feet above the sea. At this place temperature fell in January 1886 to $-88^{\circ} \cdot 8$, being absolutely the lowest temperature of the air yet known to have occurred. The lowest mean temperature in America is nearly -40° , over the region situated a little to the north of the magnetic pole. For obvious reasons no such low temperatures occur in the southern hemisphere at any season.

In the northern hemisphere the ocean maintains a higher temperature than the land in regions open directly or indirectly to its influence, as is seen not only in the higher latitudes to which the isothermals push their way as they cross the Atlantic and Pacific, but in their irregular courses over and near the Mediterranean, Black, Caspian, and Baltic Seas; Hudson's Bay, the American Lakes, and all other large sheets of salt and fresh water. The influence of the ocean and ocean currents in keeping up the temperature during the winter months is most strikingly seen in the North Atlantic, where the isothermal of 35° reaches a much higher latitude in midwinter than anywhere else on the globe.

In the southern hemisphere the highest isothermals are 90° in Australia and South Africa, and 85° in South America. It is to be noted that in January, the summer of this hemisphere, the lowest isothermal is 25° in the Antarctic Ocean to the east of South Victoria; whereas in July, the corresponding summer month of the northern hemisphere, the lowest isothermal is only 35° , or 10° higher than in the Antarctic Ocean. The difference is due to the icebergs and icefields of Antarctic regions. In Antarctic and sub-Antarctic regions the change of temperature through the months of the year is comparatively small, the annual range being only about 10° .

In January the mean pressure of Central Asia rises to about 30·50 inches, which is absolutely the highest mean pressure for any month anywhere over the globe. Now, since the prevailing winds in this great anticyclone, which virtually overspreads nearly the whole of Asia and Europe, flow outwards in all directions, bringing south and south-west winds over Russia and Western Siberia, it follows that the temperature of these inland regions is considerably higher than would otherwise be the case. On the other hand, since the prevailing winds are north-west, north, and north-east on the east and south of Asia, the temperature of these regions is thus abnormally depressed. Indeed, so strong is this influence of wind direction and ocean combined, that the isothermals run, roughly speaking, north and south in the west of the Europeo-Asiatic continent, and do not assume an east and west direction till about 70° or 80° long. E.

Since in Siberia light airs and calms prevail, and the general drift of the atmosphere is N.N.E. towards the higher latitudes of the Arctic regions, the temperature continues rapidly to fall in that direction, with the result that the lowest mean temperature is not coincident with the centre of greatest pressure to the south of Lake Baikal, but occurs at Werkojansk, about thirty degrees of latitude to the N.N.E.

The other anticyclonic regions are North America, in the centre of which pressure rises to 30·20 inches; two in the Pacific to the west of California and of Chile respectively; in the south Atlantic to the west of Cape Colony; and in the Indian Ocean to the west of Australia. Such regions, and they are well marked, are found in all months and in all oceans about lat. 30° to 40° N. and S., immediately to the westward of the continental masses in these latitudes. The only apparent exception to this is in the North Atlantic in January, and the isobars of this part of the ocean for the months immediately following suggest that this is a true exception. Lieut. Baillie's isobaric and current charts of the ocean show in an instructive manner that the central spaces of these anticyclonic regions are nearly always avoided by seamen, and therefore practically long known to them. It is scarcely necessary to add that the prevailing winds blow out of them in all directions; and since these winds have the temperature of the upper regions whence they have come increased only by the increasing pressure to which they are subjected as they descend, their temperature often differs considerably from that of the surface of the sea over which they blow, but the precise temperature relations have yet to be worked out.

The lowest isobar, 28·90 inches, is in the Antarctic regions to the east of New Victoria. The observations of all months for which we have observation show that there is a permanently low pressure over these regions, lower than is to be found anywhere else on the globe. On all the maps pressure is drawn to the isobar of 29·30 inches, since observations appear to warrant this; but during the summer months

of the southern hemisphere lower isobars have been drawn for the portions of Antarctic regions for which observations have been furnished by the various expeditions which have been made into these southern seas.

The most widespread low-pressure area is in tropical regions, where pressure, except in the eastern half of the Pacific, falls below 29·85 inches. In this extensive region, which covers about two-fifths of the whole surface of the globe, there are three areas where pressure falls still lower. These are the north-west of Australia, Southern Africa, and South America. A line drawn round the globe along the path of least pressure of this zone separates the north and south "trades," indicating the belt or still narrower zone towards which these great aerial currents blow. In the Atlantic and eastern half of the Pacific, where the barometric gradient is well marked, these winds are mapped out with equal distinctness; but in the western part of the Pacific, where the gradient is low and indistinctly marked, the direction of the prevailing winds is irregular and obscure, and it is probable that increased observation will the more strongly illustrate this remark.

It will be observed that the path of least pressure lies north of the equator in the Atlantic and Pacific Oceans. But in the Indian Ocean it is, at this season, south of it, lying in a line from Seychelles to the north of Australia. In this restricted region the winds are especially interesting as illustrating Buys Ballot's law of the wind in the southern hemisphere.

The next most important low-pressure system overspreads the northern part of the Atlantic and regions adjoining, the lowest mean pressure being 29·50 inches from Iceland to the south of Greenland. It is this region of low pressure which gives to Western Europe its prevailing south-westerly winds and to North America its north-westerly winds in winter. By these the temperature of Western Europe is abnormally raised by its prevailing winds coming from the ocean and from lower latitudes, and the temperature of North America is abnormally lowered by its prevailing winds coming from Arctic regions and from land in the season when the effects of terrestrial radiation are at the maximum. The opposite action of these winds, which are component parts of the same atmospheric disturbance about Iceland, is shown by the temperature on the coast of Labrador being only -13° , whilst in the same latitude, in mid-Atlantic, it is 45° , or 58° higher. This low-pressure region extends eastwards beyond Nova Zembla, and from the resulting winds which follow that extension the rigours of the winter climate of the north of Russia and Siberia, as far east at least as Cape Severo, are materially counteracted.

The remaining cyclonic centre is in the North Pacific, the lowest isobar being 29·55 inches south of Alaska. The effects of this low pressure on the prevailing winds, and through these on the temperature and rainfall of the north-east of Asia and the north-west of America, is

exactly similar to the effects of the low pressure of the Atlantic on the climates of Europe and the United States.

The influence on the pressure of the Spanish and Italian peninsulas on the one hand, and on the other the influence of the Mediterranean, Black, and Caspian Seas is strongly marked; and equally so do the Arabian Sea, India, and the Bay of Bengal leave their mark on the isothermals, isobars, and the winds.

July.—This is the typical month of the summer of the northern and of the winter of the southern hemisphere. The three regions in Asia, Africa, and North America, enclosed in June with the isothermal of 95° , and marking off the hottest regions of the globe in that month, cover now a wider extent, and include maximum temperatures a few degrees higher, indicating absolutely the highest mean temperatures that occur anywhere or at any season.

Among the most interesting features of the climates of restricted regions shown by the isothermals may be enumerated the relatively low temperature of Nova Scotia, the coast of Morocco, Burmah, and Victoria in Australia; and the relatively high temperature of the eastern division of India sheltered from the summer monsoon, and the inland regions of Scandinavia, Spain, Italy, and Greece. In these months the influence of the Red Sea, the meteorology of which has recently been contributed to science by the Meteorological Council, is conspicuously seen in maintaining a low temperature, and thereby breaking the continuity between Asia and Africa of the isothermals of 90° and 95° . The crowding together of the lines in California, and from the Bay of Biscay to the south of Algiers is very remarkable.

The more important changes of the distribution of the pressure are an increase over the southern hemisphere generally, with very slight exceptions in South Africa, New Zealand, and the south of South America; India, except the north-west; Japan; a patch of Europe, extending from the north of Spain to Hungary; the south-western half of the North Atlantic, and the continental portions of North America from the Gulf of Mexico north-westward to lat. 55° . Elsewhere pressure has diminished, but particularly over Asia and Europe, except the regions mentioned above, the northern half of the North Atlantic, and nearly the whole of British America.

In this month the pressure of the northern hemisphere, taken as a whole, falls to the annual minimum. If 29.95 inches be accepted as the mean pressure of the atmosphere over the globe, which is very near the truth, then the whole of this hemisphere, excepting the anticyclonic regions of the Atlantic and Pacific, has a mean pressure below the average. This great seasonal depression has its centre marked off by the isobar of 29.40 inches, extending from Mooltan to Muscat, and is absolutely the lowest continental pressure occurring anywhere or at any season. This great depression, which may be roughly regarded as

coterminous with the land of the northern hemisphere, may be justly considered as ruling the climate and weather of this half of the globe during the summer months.

Subordinate centres of low pressure are to be seen in North America, between South Greenland and Hudson Bay, south of Iceland, in Scandinavia, in Spain, and in the valley of the Po, the last four being, however, comparatively slight. In America the lowest isobar is 29.75 inches. In Africa the increased heat seems to result in a widening apart of the isobars from the Red Sea to Sierra Leone, rather than in the formation of any distinct cyclonic centre.

In addition to the four anticyclones in the Atlantic and Pacific, anticyclones appear also to the west of Australia, in South Africa, and in Australia, in the last case reaching the maximum for the year. In the southern hemisphere, about lat. 30°, pressure rises over long stretches to or above 30.20 inches; and nowhere, except in the comparatively short distance from long. 170° E. to long. 140° W., does it fall below 30.00 inches. It is to this belt of high pressure that the part of the air which has been removed from the continents of the northern hemisphere has no doubt been transferred.

In January the highest mean pressure in Asia is a little more than 30.50 inches in the upper valley of the Amur and the region to the south-west of it; whereas in July the lowest pressure, 29.40 inches, is at a considerable distance from the above, being located in the valley of the Indus and south-westwards to Muscat. The difference of pressure between these two extreme months is thus 1.10 inch, or fully a thirtieth part of the entire barometric pressure, nearly the whole of the difference being occasioned by the difference of temperature of the two months, the rainfall being so small that it may be regarded as practically nil at these times of the year. In North America and in Australia the difference of pressure of January and July is only 0.45 inch.

In the remarks on January it was pointed out that the centres of maximum pressure and minimum temperature, which are respectively these maximum and minimum data for the globe for any season, are far from occupying the same geographical area. But in July the regions of minimum pressure and maximum temperature are virtually coincident. In this region the climate is remarkably dry and rainless, or nearly so, and substantially the same climatic characteristics distinguish the more restricted regions of low pressure in the United States, Scandinavia, Spain, and North Italy. The point is of considerable importance in atmospheric physics, as showing that when the sun's heat is strongest cyclonic areas of low pressure are generated in dry climates; whereas in winter, in the higher latitudes, cyclonic areas are formed in humid and rainy climates.

One of the most remarkable illustrations of the respective influences of land and water on the courses of the isobars is seen at this season

in the higher pressure maintained from the Straits of Gibraltar, eastwards to the Sea of Aral by the extensive sheets of water for which this region is so remarkable. The crowding, widening, and deformation of the isobars in the different parts of the region are curious and highly instructive. On the other hand, the diminution of the pressure shown by the isobar of 29.80 inches immediately to the north in eastern Russia, where there are no water surfaces, is equally striking.

As Australia is an island sufficiently large to show the climatic features of a continent, it is interesting to note in connection with the anticyclone overspreading it at this time, that on all coasts the winds blow out from the land seawards. This, therefore, is the dry season of Australia.

One striking feature of the oceanic anticyclones deserves attention. The isobars crowd more together on their eastern sides, where they press closely upon the continents adjoining, than on their western sides, where they are prolonged westwards through their respective oceans. The prevailing winds of continental coasts adjoining the central and southern portions of anticyclonic regions are usually dry for two reasons; they advance from higher to lower, and therefore warmer latitudes, and they have traversed the evaporating surface of the ocean but a comparatively short way since their descent from the higher regions of the anticyclones. The arid climates of California, Peru, Morocco, and south-west of Africa at this time may be referred to as illustrations.

The July isobars of India are of more than ordinary interest, implying, as they do, the utmost practical advantages to the empire. From Cutch southward pressure is everywhere higher in the west than in the east of the same latitudes, represented by the south-easterly slant of the lines as they cross India. The difference is about half a tenth of an inch, and the same difference also holds good in Ceylon. The consequence of this peculiarity in the distribution of the pressure is that the summer monsoon blows more directly from the ocean than would have been the case if the isobars had lain due west and east. A much more important consequence, however, follows from the location of the region of least pressure in the valley of the Indus, so that in the valley of the Ganges, and in the north of India generally, pressure diminishes steadily from east to west—from Assam, up the Ganges, and westward to Jacobabad on the Indus. The inevitable result of this inversion in the manner of the distribution of the pressure is that the winds are no longer south-westerly, but they become southerly over the Bay of Bengal, and thereafter deflected into E.S.E. winds blowing up and filling the whole valley of the Ganges, and distributing in their course a generous rainfall over this magnificent region. If winds there had been south-westerly, the rainfall would

have been meagre and inadequate, owing to the intervention of the Western Ghats between the sea and the Ganges.

It will be observed that the low-pressure system of Asia and the anticyclonic system of high pressure of the Atlantic are connected by what is virtually an unbroken broad belt of westerly winds over Europe and western Asia, bearing with them much vapour from the Atlantic to which is due the summer rainfall of these parts of the old continent.

It has been explained that the centres of anticyclones are occupied with a vast column of descending air, which as it descends becomes continually warmer and drier; and also that the limiting isobars of the anticyclones press close together on the west coasts of the adjoining continents out of which the air currents spread over these continents. Now an examination of the surface winds of the anticyclones in their middle and southern portions in the northern hemisphere, and in their middle and northern portions in the southern hemisphere, show clearly that they traverse but a small part of the ocean before reaching the adjoining continent, and further as they thereafter pass in lower latitudes they become still drier as they advance. The inevitable result is that the parts of North and South America, and of the north and south of Africa where these anticyclonic winds prevail, are virtually rainless barren deserts; and they will remain so as long as the present geographical distribution of land and water remains substantially as it is. On the other hand, as the winds which blow in upon the continents on the side farthest from the equator, must arrive at the land after traversing a considerable portion of the ocean, and thereafter advance into higher latitudes and therefore colder climates, the rainfall over such regions is generous in amount, and in many cases, in even undue excess. In illustration may be cited, the arid climate of Lower California as contrasted with the west coast of British Columbia, the annual rainfall of San Diego being only 10 inches, whereas that of Fort Simpson is 100 inches.

Or stating more generally the relation of the isobaric lines to the rainfall, which, from the hygrometric conditions it involves, impresses on climates their more characteristic and beneficial features, the greater the distance the winds have traversed the ocean before they strike the coast, the more copious is the rainfall; and the less the space so traversed, in the same proportion do the climates of the land surfaces approach a rainless aridity, even though the winds arrive direct from the ocean. Thus the isobaric lines and winds for July show that among the regions of the globe where the rainfall is large are India, the winds there having really traversed the ocean from near latitude 30° S.; the United States, the prevailing winds arriving there after having traversed nearly the whole breadth of the Atlantic, and the Gulf of Mexico; and Japan, to which the prevailing winds arrive after traversing more than half the breadth of the Pacific to the south-eastward. Again, in January,

the winds of the British Islands and Norway have previously passed over a large portion of the Atlantic; and as regards the East India Islands, the prevailing north-easterly winds of winter bring a heavy rainfall gathered during the long course they have pursued over the Pacific. Where the continental masses of land are of comparatively small extent, as in Australia and South Africa, and the isobaric systems therefore less likely to be fully developed year by year, there the most serious droughts occur from time to time.

The desert of Gobi is caused by quite a different set of meteorological conditions. During winter, the wind system of this region is part of the general atmospheric movement of Asia, which proceeds from the centre of the continent in all directions towards the surrounding ocean. Hence the region at this season is practically rainless; and during summer the winds in this part of the continent become northerly as they follow the general atmospheric movement in upon the low pressure system in north-western India, and hence in this season also the climate is rainless. The point to be insisted on here is that these regions are made deserts by the meteorological conditions of pressure and the resultant prevailing winds, which in their turn are the inevitable result of the present distribution of land and water over the face of the globe.

The isobaric maps show in the clearest and most conclusive manner, that the distribution of the pressure of the earth's atmosphere is determined by the geographical distribution of land and water, in their relations to the varying heat of the sun through the months of the year; and since the relative pressure determines the direction and force of the prevailing winds, and these, in their turn, the temperature, moisture, and rainfall, and in a very great degree the surface currents of the ocean, it is evident there is here a principle applicable, not merely to the present state of the earth, but also to different distributions of land and water in past times. In truth it is only by the aid of this principle that any rational attempt, based on causes having a purely terrestrial origin, can be made in explanation of those glacial and warm geological epochs through which the climates of Great Britain and other countries have passed. Hence the geologist must familiarise himself with the nature of those climatic changes, which necessarily result from different distributions of land and water, especially those changes which influence most powerfully the life of the globe.

Mr. R. H. SCOTT (Meteorological Office): I think the Society may congratulate Mr. Buchan on being able to lay before it the results of investigations upon which, to my knowledge, he has been engaged for the last quarter of a century. Mr. Buchan commenced to make his charts of the distribution of barometric pressure and wind, which were published about twenty-two years ago, somewhere about the year 1865; and now in the year of grace 1891 he comes to lay before you the conclusions to which his ripened judgment has led him. Of course, owing to the number

of questions which Mr. Buchan has dealt with, it is impossible to discuss any one of them; he has merely lightly touched on the subjects leading to the conclusions he has arrived at. However, this is not the place or the time to enter into a discussion, because there may be some slight differences of opinion; but I think we are exceedingly obliged to him for having taken the trouble to put all these results together. In bringing forward these remarks he has talked about the distribution of land and water which has produced the climate that exists. There is one question I should have liked to have heard him take up; that is, the subject discussed by some foreign physical geographers as to what is required to reproduce the glacial epoch in England. They say what is wanted is merely to submerge Germany and Russia, which could be done by lowering the level of the land some 200 feet; so, really, it does not require any very great disturbance in the distribution of land and water to produce this phenomenon. As regards the question of the work of the *Challenger*, it is exceedingly interesting to me to hear that Mr. Buchan has found that we never on land get anything like the wind which is met with on the open sea. Of course I know myself, from experience in the interior of the continent of Europe, that the wind there is nothing like what it is on our own west coast. We have heard from ships of tremendously strong winds in the Atlantic and we certainly in our office never believed the reports, as the observers had not instruments on board to prove that the wind actually reached the amount of violence reported in the logs; but it appears from the observations of Mr. Buchan that, on nearing the coast, a very considerable diminution in the force of the wind is found. However, with reference to the whole of the subject, I think that till Mr. Buchan's paper is in print and condensed, it is hardly time to discuss it, or to give any opinion upon it until one has had time to consider carefully the conclusions at which he has arrived. I congratulate him most sincerely on being able to bring the paper before this Society.

Mr. F. GALTON: The only point to which I would draw attention is the extraordinary advance that Europe has made during this century in meteorology, an advance parallel to that made in the science of geography, with which we are more especially concerned here. Not many years back it would have been totally impossible to have constructed a map with these isobars and isotherms indicating the distribution of meteorological phenomena over the face of the globe, as all the necessary information for doing this has been collected in comparatively recent years. Again, although people may justly say that our predictions of the weather issued by Mr. Scott are by no means as perfect as they might be, and though we cannot even roughly anticipate more than thirty-six or even twenty-four hours, still a very great advance has been made from what was formerly possible. Therefore we ought not to be discouraged by the length of time it may take to approach to perfection, considering how very much has been done in this one century. The great thing we now want to know is the state of the air above us, for we are at the bottom of an aerial ocean and all we know is what takes place at the bottom. Imagine how little a marine animal that lived at the bottom of the sea, having the same intelligence as ourselves, would know of the currents above. That is precisely our position; we understand only one horizontal section of this superincumbent mass. Mr. Buchan has done a great deal in endeavouring to add, as far as the geography of England and Scotland will permit, to our knowledge in this respect, by his advocacy of the construction of an observatory on Ben Nevis, and I should like to take this opportunity of saying how much it would add to the interest of the daily returns from that observatory now published in the *Times*, if returns from Fort William were given at the same time, so that we should be easily able to compare the results obtained from these high and low-level stations.

Admiral Sir ERASMUS OMMANNEY: I should like to ask one question, Sir, as to the great contrast of readings of the barometer in the Arctic as compared with the Antarctic zones, which differ we know from observations made. The barometer stands about an inch lower in the Antarctic than in the Arctic regions. I do not know whether you have considered the matter, but if you have, it will be of great interest.

Mr. DOUGLAS FRESHFIELD: Mr. Galton has spoken of the importance of knowing what is above us in the atmosphere. It is a common observation of weather-prophets in the mountains, that great changes of weather are preceded by changes in the upper sky, which do not precede minor local disturbances. It would be of interest if Mr. Buchan could tell us what is the force of the wind as observed at the different high stations in Europe, not only at Ben Nevis, but at those of double the height, on Etna, in the Pyrenees, on the Pic du Midi, and in the Alps, at the St. Bernard, on the Säntis, the Sonnblick, and elsewhere; whether the winds at these stations are of the same force as they are on the great oceans. I would point out that there is now an opportunity for meteorologists, which I hope they will avail themselves of, in the new cabin at the height of 14,000 feet on Mont Blanc, where undoubtedly an observer could live for six months, and an enthusiast might conceivably stay the whole year. The general opinion is that the wind is very much stronger at such heights, but I do not think this is necessarily true, as a little extra cold in a gale makes it appear much stronger, and of course at these elevations the winds are often icy. At the beginning of the greatest of the storms which characterised last summer, a party of men, perfectly capable of taking care of themselves, were swept off one of the ridges of the mountain by the force of the wind. M. Janssen's observations of the force of this gale at this cabin proved that it was not equal in violence to the great tornado he experienced in Hong Kong. The relatively high temperatures noted by mountaineers on Alpine summits during winter ascents, seemed to demand more explanation than they had yet received.

Mr. BUCHAN: As regards the force of the wind at Ben Nevis we have little idea here, save perhaps in great storms, which I do not believe at all equal what is often felt there. They have drawn up a scale 0-12 in Mr. Scott's style that is used throughout the whole of the world; what is registered as eight at Ben Nevis would be registered here as twelve. Twelve would equal about 120 miles an hour, and such is the great strength of the wind, that in making observations all three men have to go out roped together, and creep along on hands and feet. There are many important things which there is not time to go into; for instance, it not infrequently happens, looking at the isobars issued by the Meteorological Office of the surface winds, that the winds at the top are opposite to the isobars. It repeatedly occurs that when the wind all round the British Isles is light, exceedingly strong winds are experienced on Ben Nevis, winds that lasted on one occasion a fortnight, with force of from ten to eleven, equal to about 112 miles an hour. At the level of the top of Ben Nevis we have a totally different distribution of the earth's atmosphere from that below, and we should be delighted if the information Mr. Galton desires appeared in the newspapers—it is a matter of expense, as it would mean a great deal more for the daily telegraph. We are very desirous of bringing it about, and perhaps by and by may be able to do so.

Captain H. TOYNBEE: Having spent thirty-three years at sea, chiefly on voyages to India, I have passed many times through the areas of high and low barometric pressure which are depicted on Mr. Buchan's charts. After that time I was twenty-three years in the Meteorological Office examining the logs of ships, so that I am able to say that these areas and their corresponding winds are con-

firmed by experience. It would have been a great advantage to me had I possessed such charts during my voyages. With regard to Mr. Galton's remark on the importance of observing the upper currents of air, I think that any further advance in meteorology depends on such observations. For instance, our present weather is related to the fact that an area of high barometric pressure has existed for some time over our islands, and has warded off the cyclonic systems which generally pass over us on their way to the north-eastward or eastward, especially in winter. This year most of those systems have passed to the northward of us on their way to Norway. We should like to know the peculiar circumstances which caused the upper air to settle down over our islands, instead of passing further east towards central Europe, where an area of very high pressure is generally constant in winter. On these grounds I have ever pressed upon the captains and officers of ships, who have undertaken to observe for the Meteorological office, the importance of noting the direction from which cirrus-cloud is moving. It seems possible that cheap balloons might be used to advantage where upper clouds are not seen. This is proved by the following anecdote told me by my old friend, the late Mr. W. H. Bayley, who was then secretary to the Revenue Board of Madras. An aeronaut came to Madras and advertised an ascent, fixing an hour when the sea breeze had set in, with the object of his being driven over the land. There were no upper clouds to show the motion of the upper current of air, but Mr. Bayley thought the man might have made a mistake, so he took his binoculars to the top of his office and watched the balloon. At first it drifted quickly to the westward over the land, but it soon gave a peculiar twist and then moved seaward so quickly that, although the man pulled the string of the valve so hard that it jammed open, allowing the gas to escape very freely, he fell into the sea two or three miles from the land, and the boats of ships in the harbour raced out and saved him. I have always held Mr. Buchan's opinion that currents of the sea are produced by the action of wind, which is well shown by Mr. Clayden's model about to be exhibited in the Royal Naval Exhibition. Mr. Buchan's paper has interested me much, and I hope he may enjoy another twenty-five years of work with equally good results.

Dr. RAE: Might I be allowed to say a few words in regard to the centre of cold in North America. In 1850-1 I wintered in latitude 67°. We had cold 73° below zero. My thermometer was tested by the Meteorological Office, and the mercury was frozen six to seven days continuously, and I think this is colder than has been recorded in any other part that I know. This was at the north-east end of Great Bear lake; the lake, of course, might affect the temperature, but it was completely covered by ice. I think this temperature is the same as that registered by Captain Nares in Smith's Sound. I believe that Captain Ross's party, when as near as possible to the magnetic pole, never registered so great a degree of cold.

Mr. BUCHAN: Of course in my paper I have been dealing not with single temperatures, but with averages. Might I ask if you took this observation in a valley with high ground round you?

Dr. RAE: The ground was rather low; my instruments would be 10 to 12 feet above the lake, and the lake is about 300 to 400 feet above sea-level.

The PRESIDENT: There is a thought which I am convinced passed through the minds of a great many people when Mr. Scott was speaking, and it was this, that although there was nothing in the evening papers about the submergence of Germany or Russia, there was some reason to think that the glacial period had returned already. However that may be, we are all very much obliged to Mr. Buchan for having come here to-night in such dreadful weather, and from a long distance, and for having given us the result of his observations and reflections hived up through so many years. I trust that he will not be a sufferer for having done so. I know

that Mr. Buchan is in somewhat infirm health, and that his throat is a weak point. I was pleased, however, to observe that his voice showed no faltering as he proceeded, and I trust and hope that to-morrow he will not have to regret the great amount of pleasure and instruction he has given to a large company of this Society.

Notes on a Botanical Trip in Madagascar.

By G. F. SCOTT ELLIOT.

I LANDED at Madagascar in December, and, after a few days at Tamatave, proceeded to Antananarivo. After a fortnight's stay in the capital, I then started on my journey south-eastwards, and after six weeks' almost continuous travelling, I arrived at Fort Dauphin, the extreme south-eastern corner of the island. Most of this route is over very well-known ground, and Messrs. Baron, Grandidier, Hildebrandt and others have very thoroughly described the character of the country. The first part of my journey was to Lake Itasy, which is about two days' journey west of the capital. This district deserves notice, as the geological structure is peculiar. I passed over two rather extensive basalt flows, which appear to be of rather recent date, though the absence of any overlying rock renders it impossible definitely to fix their age. On this basalt there is a distinct change in the vegetation. *Lysimachia parviflora* and a few other species are more common, and *Clematis anethifolia*, *Kniphofia pallidiflora*, and others appear almost confined to it. The whole district near Lake Itasy is volcanic; the country is studded with small cones of scorïæ, rising (in the neighbourhood of the lake) out of a level, marshy plain, and one is tempted to assume that the lake lies in a hollow due to the subsidence of the land through volcanic action. From Lake Itasy I went to Mr. MacMahon's station at Ramainandro, and near here I saw the celebrated subterranean river. It is a very simple formation. The strike of the strata is east and west nearly, and the river, running in the same direction, has burrowed its way underneath a harder layer of rock, which latter has subsequently broken off in large boulders and covered the stream.

I next passed through the Ankaratra Mountains, which rise to about 10,000 feet, and appear to be of rather a different rock to the ordinary monotonous gneiss and granite of Imerina and the Betsileo. These mountains are very misty, and never suffer, so far as I could see, from the drought prevalent over most of the country.

Corresponding to this climatic change, there is a distinct change in the vegetation. The higher mountain plateaux and hillsides are covered with luxuriant grass, amongst which there is a profusion of flowers. Orchids—especially such forms as *Eulophia*, *Habenaria*, *Satyrium*—are especially abundant. Gentians of various species are also common, and many kinds of *Stachys* and *Salvia* also grow in this part.

The ravines of these mountains are often filled with patches of forest, and it is interesting to see how these woods are strictly confined to the more sheltered places. The trees along the outside edge of a ravine, and which are therefore exposed to the wind and sun, show a stunted and branched condition. This exposure to wind and drought explains the absence of trees over the parched, steppe-like plains of Imerina, where all the vegetation consists of very small shrubs with a prostrate, much-branched, wiry habit, more like heather than any other English plant.

The rest of my journey to Fianarantsoa, and south of that town to the border of the forest at Angalampena, lay over these low, broken, gneissose hills, intersected by numerous rivers and with green rice-fields lying in every valley. The plants become sometimes taller and more luxuriant by the riversides, and in the rice-grounds one finds many common weeds of cultivation, but the rest of the country is almost wholly covered by the indigenous forms, such as *Hypericums*, *Indigoferas*, *Desmodiums*, *Otiophoras*, *Phaylophis*, *Commelyna*, and many others.

There is an interesting mountain lying to the east of the road near Fianarantsoa. According to Malagash tradition, its misty summit is inhabited by the ghosts of the dead. When the cannon are fired in the capital at the feast of the new year answering salvos of ghostly artillery are said to be heard from the mountain top. Mr. Shaw told me he had once managed almost to reach the summit, and he found the valleys had a peculiar bend and shape which might form an echo, so that this may really be a fact.

The most interesting part of my journey began at Angalampena, about 50 miles south of Fianarantsoa. This is the inner limit of the forest, and, as nearly as I could calculate, the mountains are at this place about 4000 feet high. There are two parallel ridges, running nearly north and south, and separated by a river of considerable breadth. The river seems a branch of the Mangoky, and apparently turns to flow westwards a few miles inland. After crossing the river, and a rather dangerous morass which covers about two miles of the road, one has the second mountain ridge to traverse. This is the watershed of the island, the rivers on its seaward side draining into the east coast, while those on the inland side eventually fall into the sea on the western coast. The whole of these mountain ridges and their valleys is covered with a well-grown and dense forest. It is difficult, in fact, to get a good idea of the country until one emerges on the eastern flanks of the second ridge. The view from this side is very beautiful. Below one's feet lies a long, very deep valley, with a broad river running eastwards. Little villages are placed on flanking spurs of the hills, while the mountain ranges to the westward, rising one behind another, are covered with forest. Every here and there an abrupt granite precipice appears amongst the trees. The level of the valley is 1000 feet below that of the river flowing west. The forest is here very narrow.

It only took me about six hours to cross from Angalampena to Ankitsika. The road, however, is indescribably bad, and it is seldom used, and broken by morasses, gullies, and irregular boulders. The forest is, however, very beautiful. There are numerous orchids—a very delicate *Streptocarpus* (*S. Hilsenbergii*). Plectranthi and other flowers grow in great profusion. The extreme narrowness of the fever-stricken forest belt in this part may make in the far future this route an important one in proceeding to the interior.* At present, however, it is one of the worst, as the tribes in this part are quite independent and almost always fighting. Their villages are also extremely miserable, and kept in an indescribable state of dirt.

The forest appears to have originally extended to the sea in this part, but the natives have burnt it almost all down in clearing the ground for rice. The whole of the country from this place, Ankitsika, to Vaingaindrano, consists of gentle hills and valleys, with occasional marshy tracts, and intersected by numerous rivers. These hills consist of gneissose and granite, outliers of the main north and south mountain chain; they are largely covered by a very scabrid grass, quite useless for cattle, and by the bracken fern. In the more marshy places great numbers of the travellers' tree, *Ravenala madagascariensis*, occur; and along the rivers, and in particularly sheltered valleys, one sometimes finds parts of the original forest remaining. The whole vegetation becomes utterly different when one has passed the forest, which is a thoroughly natural floral boundary. As one approaches Vaingaindrano the country becomes more open and the hills gradually become much lower, while large tracts of flat alluvial ground become more frequent. The population also becomes very much more numerous. Mahamina, Ankarana, Betsiraha, &c., are all large towns, and are garrisoned by the Hovas.

Vaingaindrano is a very important place, and here the alluvium becomes of very large extent. The river at Vaingaindrano is a particularly fine one, and as broad as the Thames at Charing Cross. Unfortunately it is useless for navigation, as there is the usual bar of sand at the mouth. However it appears to have formed a large tract of fertile soil; probably there is not less than 60 square miles of good alluvial land. This is so unusual a fact in Madagascar that it is probable this place will at some time be of great importance.

The next part of my journey was along the coast, and never more than 15 miles from the sea. The country is entirely independent of Hova control, and one has to exercise the greatest possible care. The general features of the country are similar to that already mentioned, but besides the low hills and ridges springing from the inland ranges, and composed of gneissose and granite soil, there are vast stretches of

* The forest takes about three days to cross by the ordinary Tamatave route, and is nowhere so narrow as here.

sandy dunes, broken by lagoons, rivers, and marshes. These are a continuation of the series shown on the eastern coast further north, and are due to the same cause. The rivers are particularly fine. Mansianaka, Ishandrovinang, Manambondrona, Manambato, and Matitana are particularly fine streams, and none of them less than 50 yards across; and there are five other important rivers on the road. As one approaches Fort Dauphin the mountain range gradually trends nearer and nearer to the sea, until it is only about six miles from the coast; while at Vaingaindrano it must be at least 50 miles inland. Fort Dauphin stands on a rocky promontory, and is surrounded by miles of sandy dunes. I passed twice over this route, as, after waiting three months at Fort Dauphin, I was obliged to go back by land to Ambahy, where I obtained a passage to Mauritius. The itinerary on the second journey was—1st day, Manafiafa (St. Luce) (trader here); 2nd, Anbanihazo; 3rd, Isama; 4th, Manantenina Ambalaharana; 5th, Ishandrovinang Ambalafandrano; 6th (trader's house at mouth), Manambondrona; 7th, Mansianaka; 8th, Betoof Benanarema (trader). The villages mentioned on the map at Somisika, Vohibarika, and Nasi Colombal seem to have been abandoned as far as I could gather from the natives.

It only remains to give a short account of the soil and vegetation of the country. The forest is in most places a very disappointing one. Thus, near Fort Dauphin, where I managed to get to know it fairly well, there is very little really good timber. The forest growing on the maritime sands is peculiarly poor. The trees are seldom more than 30 feet high, and are usually very bushy, and of low diameter. One only sees really fine-grown trees in the deepest parts of the forest, particularly in valleys amongst the hills and alluvial patches along the rivers. The amount of humus in the forest is, usually speaking, very small. In most parts the natives, after burning the forest, usually find that two or three years of rice-growing has exhausted the soil, and a fresh portion must then be cleared. The commercial value of the timber seemed to me to be of a very dubious nature. The wood will not float; and in the parts of which I could speak from personal knowledge, eight miles, at the very least, of haulage through sandy loose soil would have to be done for every piece of timber. Moreover the extent of the supply has been enormously exaggerated. I should doubt if between Angalampena and Fort Dauphin there is as much good timber as exists in the Knysna forest of South Africa. The forest contains many species of *Weinmannia*, *Croton*, *Ficus*, *Homalium*, and *Coleus*. There are numerous *Dracenas* and *Pandanus*, and *Rubiaceae* are very abundant. The beautiful orchid, *Angræcum superbum* is fairly common on old stumps, and *Bolbophyllums*, *Eutrophias*, *Habenarias*, and many other genera of the same family abound. *Acanthaceae* are very numerous, both in species and individually. A common character of the trees lies in their leaves, which

are usually hard, coriaceous, rolled at the edge, and often serrated. Very few are really deciduous.

The ordinary soil of the cleared parts of this district is a gneissose clay, coloured red by the decomposition of iron salts, and usually very much hardened and caked together on the surface by the sun's rays. This soil is distinctly bad for coffee, sugar, and tobacco, though the last can be grown upon it; so bad, in fact, that I could not see any prospect of successful plantation. It is covered by a large number of indigenous plants, almost all specifically distinct from those of the interior steppes of Imerina and the Betsileo. The plants are chiefly small heathery-leaved shrubs, with many orchids and gentians in the more marshy places.

A very large proportion of the coast is made up of the sandy dunes and flat marshy, sandy-alluvial patches mentioned above. The sand appears to be of a pure white maritime nature, and the worst possible for vegetation. In the south, about two days' journey from Fort Dauphin, there is a desert as dry and arid as Namaqualand, the Antandrai. It is covered by *Opuntia*, and the natives are said to be confined to this plant for water during most of the year. The plants, from the few I obtained, were all peculiar forms found nowhere else.

Along the eastern coast this sand occupies long stretches of country. I connected its presence with the peculiar projecting points of the land at St. Luce and Fort Dauphin, and the presence of a strong coast current, which during half the year flows southwards, and the rest of the year northwards. It is, I think, because of this current that none of these fine rivers are navigable. They are often completely blocked by a bar of sand for months, and there are always changing beds at the mouth. Possibly the interrupted reefs of coral may have an effect, but of this I cannot speak for certain. At any rate, I was often struck by the parallel between the southern part of Africa and that of Madagascar in all these points. The highlands of the interior correspond to those of the Transvaal. The Antandrai desert corresponds to Namaqualand. The forests correspond to the belts of the Knysna, Pondoland, and Natal, and the perverse nature of the rivers on the eastern coasts commercially speaking, is exactly the same. The harbour at Fort Dauphin is open to north-east winds, but is otherwise fairly safe, and only has a single hidden rock. The others, St. Luce, Ambahy, &c., are really open roadsteads with a dangerous coast, and it is not till far to the north that a good harbour can be found.

The people in this district are not very well known. The Antaisaka inhabit Vaingaindrano and the neighbourhood, and their appearance is strikingly different from that of the rest of the Malagasy. They are short, and rather thick set. The part of the leg below the knee is shorter relatively than usual. Their features are more square and rather more prognathous, and their hair is more frizzy though not woolly. They seemed to me to be very probably crossed with the

original inhabitants dispossessed by the Malayo-Polynesian stock of which the Hovas and Betsileo are the descendants. They are extraordinarily expert with the spear, which may account for their survival. It is a small tribe not extending far from Vaingaindrano. The next strip is occupied by the Antaisara. The King of Manambondrona has a nominal suzerainty over the whole district, and is said to have 5000 warriors under him, which would make a population of 30,000. They are utter savages, dressing in mats made of rushes, ignorant of money, and each little village is usually at war with its neighbour. The population is chiefly along the base of the mountains and in the valleys, where the soil is good enough for their cattle and rice-growing. The neighbourhood of Fort Dauphin is occupied by the Antanassi, who are in subjection to the Hovas, and in rather a miserable condition. Both these tribes (Antaisara and Antanassi) are distinctly of the same race as the Hovas and Betsileo, but one very often meets individuals with a distinctly Arab cast of features. It is very probable that the Arabs traded with those people in past times. Charms written in degenerate Arabic are found amongst some of the tribes.

The general conclusion I drew from my journey, was that, in this part at least, there was no probability that European colonisation could ever succeed. The traders along the coast manage to live in a very miserable way and that is all. Vaingaindrano is a possible exception, as here there might be a reasonable prospect of success. I found a large proportion of cosmopolite weeds of cultivation in the neighbourhood, which is a promising sign.

Unfortunately, however, it is only the sandy and rocky parts such as Fort Dauphin, which are fairly healthy and free of fever. The insalubrity of the climate varies exactly with the amount of wet alluvium and moist humus, that is, with the fertility of the soil; and the terrible existence led by the few Creole traders on the coast leads one to hope that this country will be left entirely to the natives, who may in time become a civilised and Christian people.

*Some Further Notes on North Morocco.**

By WALTER B. HARRIS.

FINDING myself in Fez for the second time this year, I determined to return to Wazan, where I had taken up my headquarters for the summer, via a route very little travelled over.

I therefore left Fez one day early in August, and passing through the quarter known as M'nsoda, leaving the handsome tomb of Sidi Ali bu Rhaleb on my right, left the city. A ride of about an hour, for the first part through cemeteries, wooded with olive trees and rendered most picturesque on account of the domed tombs on the steep hill-sides, and afterwards through cultivated country, brought me to the famous bridge over the Sebou—a really fine structure.

The Sebou is at this spot about a hundred and twenty yards wide, but very shallow, being easily fordable and split up into numerous stony islets. The water here is perfectly clear and transparent in summer—the time of my visit was July—and it is not for some little way down, in fact until it reaches the clay soil, that it becomes thick and muddy, as most travellers see it between Hurbasseh and Chrarda, on their way to Fez from Tangier. On the further, or eastern, side of the bridge three roads diverge, one ascending a steep barren hill straight in front leading to Oujda and Tlemçen, the southern one to the Berber tribes of Ait Youssi, while the third, keeping to the bank of the river, is not the highway to any particular place, but connects the many villages on the banks of the Sebou and also leads to some of the mountain tribes-lands.

The centre road, leading toward Algeria, passes through Oulad al Hadj, a tolerably large province, thence through Hyaina to Tezah, where roads branch off to the mountain tribe of Ghietta, and the Arab tribe of Hawara, whose country borders on the Sahara. This tribe have a division of their people to the south of the Haha, and in the Sus, in Southern Morocco, being moved from their original country in the north by one of the Sultans to populate a rebellious district which he had devastated.

Taking the third path, the one on the river-bank, I travelled for two hours, when finding the road on the east bank became impassable for baggage animals on account of the steepness of the hill-sides, in which the track was cut, I had to retrace my steps and ford the river at a village of Oulad al Hadj, and pitch my camp just before sunset.

From the bridge to this spot, a distance of really only a few miles, perhaps ten, the river makes no less than six bends, in spite of its course being a valley with steep hills on either side. The general direction of the river is north-east.

* Vide 'Proceedings R.G.S.' vol. xi. p. 487.

The following morning I made an early start, and keeping to the west bank of the Sebou, lengthened my road very considerably, as there is a more direct way taking short cuts, instead of following, as I did, every turn of the river.

The scenery here is very charming, the river winding through its flat rich valley, while the high hills on either side take fantastic shapes. The valley is richly cultivated, figs, olives, melons, and vines growing in great profusion, while the remainder of the land is used for grain. The general course of the river, difficult to determine on account of its most eccentric bends and deviations, is north-east and south-west. I pitched my camp at a village high on the mountain side overlooking the group of olive-trees where the Sök al Tnain, or Monday market, is held, about 24 miles from my last camp. The only remarkable landmark passed was about two hours after leaving my camp that morning, a curious pile of rocks known as the Haj'ra al Chrifa, not unlike, but scarcely as large as, the Haj'ra al Ouerkof of the Wergha.

The following morning being market day I visited the Sök, where the presence of a European created no little stir, though the people were quite nice. Great quantities of melons and grapes were exposed for sale, the former wonderfully cheap. Jews there were too in plenty, trading from the towns with cotton goods, sugar, tea, &c.

Leaving the Sök one enters on a fertile plain, or rather a widening of the Sebou valley, which here is some two to three miles across, nor do the hills close nearer again until some six miles further down. The fertility of this spot is extraordinary, and the villages wear a much more flourishing appearance than I have seen elsewhere in Morocco, with the exception of some of the Tehars, or villages, of some of the independent mountain tribes. One of these villages contains the tomb of a saint, by name Sidi Osman, a large domed marabout, whitewashed and in good repair. The end of this plain is caused by a precipice which appears to bar the course of the river, to which it is at right angles, but the river takes a sharp turn, and flows a short distance almost due west, its previous course being north-east. Here my road left the river's bank, and ascended the hills, passing numerous well-to-do little villages. From the summit of these hills one obtained a fine view of the Sebou, which is seen only to pursue its western course for a short distance, then flowing north-west, a course it pursues in general to within thirty miles of its mouth at Mehediah, when again it flows south-west to the sea. The road crossed on the summit of these hills for an hour or two without offering any attractions to the sportsman or the lover of scenery, beyond the one peep at the river valley. Water is plentiful, one well, shaded by palm-trees, being exceedingly good.

As this was the spot where I left the Sebou, I may perhaps interrupt my account with a few remarks on that river.

I have often heard it said that the Sebou would be navigable to small draught steam lighters from its mouth to Fez. Such an assumption took my breath away on my journey down the river from Fez to Chraga. In many places the river was so shallow that in no spot was there six inches of water, while the swiftness of the current alone would prevent navigation in flooded times. Changes in weather prevented my being able to judge of the fall of the river-bed by my aneroid, but I should say that in places the bed sloped several feet in a few hundred yards, forming a shallow rapid. Whether damming and locks would be practicable is for an engineer to say, but I should think the expense would be enormous, and the result poor. So swift is the current that all along the river-banks are water-wheels, from twenty to forty-five feet in diameter, which, turned by the current, raise a great quantity of water in jars to the level of the banks for irrigating purposes, a method much simpler and more profitable than the shadouf of the Nile, where of course the water-wheel is impracticable.

I pitched my camp at the residence of Bu Mahammed, the Governor of Chraga, where I was very kindly received, as on all the road, and hospitably entertained.

Near Dar al Bu Mahammed is held the Tuesday market, or Sök al Tletta, an enormous weekly gathering. Here the following morning I was mobbed by an inquisitive but comparatively friendly crowd. From the Kaid's village one can see the great rocky mountain of Mulai Buchtah, with its two attendant peaks near it. On the summit of Mulai Buchtah is a grassy plain with a village, but only accessible by one path. There are two mountains by name Mulai Buchtah, not far apart, this being one, while the second is situated about a day's journey beyond in the Beni M'Sgilda, where the great and popular saint, from which the two gather their name, is buried.

The mountain visible from Chraga is a huge solitary limestone block, almost flat at the top, and apparently about 2500 feet above the river Wergha. Beyond this mountain lie the tribes of Beni M'Sgilda and Beni Zarul, called in my map of the North Moroccan mountain tribes, through an inadvertence on my part, Beni Zarun.* The country of the latter is rich in timber, and contains several fine forests. They are hospitable people, and, though never visited by Europeans, any one speaking their language and with proper recommendations from other tribes, or any great religious Moor, can travel with tolerable safety amongst them.

Leaving Chraga I approached Mulai Buchtah, but on account of its sanctity was not allowed to ascend it, or even to go very near. Turning away, I followed the path over the mountains, emerging on the slopes of the hills overlooking the valley of the Wergha, near the tomb and

* See map, Local Distribution of the Tribes inhabiting the Mountains of North-west Morocco, by W. B. Harris, in the 'Proceedings,' vol. xi. p. 524.

small country market of Sidi Abdul Wahad. Nothing more wild than this scene can be imagined in an inhabited district of North Morocco. The river Wergha winds and twists through a wide valley almost devoid of cultivation and covered with dense undergrowth of arbutus and other bush. The reason that this land is uncultivated is that the place swarms with wild boar and sparrows, one of which uproots the grain, while the second destroy the ripening ear and leave not a particle.

To the south of the path is a saint's tomb, or marabout, situated on the very summit of a mountain by name Sidi Abdul Nor—a very good landmark, as it is visible from a great distance.

I camped at the joint village of Oulad Osman and Beni M'kir, and was very hospitably entertained. The people—Arabs—complain of the outrages of the mountaineers, but never seem to make any resistance, though infinitely more powerful. These villages are situated in the Arab tribe of Oulad Aissa, whose frontier is close to the village of the Governor of Chraga.

There is one distinctive point about the houses in this part. Mud is laid on thickly *over* the thatch, and is said to be impervious to rain. I have seen this nowhere else in Morocco.

The province of Hyaina, which I mentioned as being traversed between Fez and Algeria, extends as far as Chraga and Oulad Aissa, the former being its western boundary after Oulad al Hadj, and the latter its northern boundary, while a succession of mountain tribes join it on the east. It is very curious how this triangle of Arabs has been able to exist among the mountaineers, their deadliest enemies.

Leaving Oulad Osman the following day, I crossed the Wergha at an exceedingly shallow ford (in August), and passing close under a conspicuous wooded mound by name Sidi Abdullah, entered the hills. The road continues to run along the base of a high jagged range of mountains known as Settah. On the summit of one rocky peak is the tomb of Sidi Meimun. The undulating plain is fertile, but not to any great extent cultivated, owing to its being the border-land of the Arabs and mountaineers, and therefore liable to be attacked by the latter.

I camped at a village of the Beni M'Sara, on the slopes of the mountains of Settah, much to the people's surprise, who never imagined a European would have the cheek to visit their country. However, after some angry and threatening words, they saw that I did not intend to go away, and equally meant them no harm, so gave me a hearty welcome, and we spent the night with music and singing and tea-drinking. Every man was armed with a long native gun and sword, while their clothes were richly embroidered in silk. As I have described this tribe elsewhere, there is no need to do so again now.*

I left the following morning before daylight, keeping along the base

* See paper on Mountain Tribes of North-west Morocco, 'Proc. R.G.S.', 1889, p. 487.

of Settah Mountains, which run nearly north and south, losing their distinct character in the hills surrounding Arba al Ouf, a large village on the Wad Ardat, a tributary of the Wergha. I reached Wazan that day, passing Arba al Ouf and crossing the Wad Ardat, then following the borders of the Beni M'Sara country to Sidi Rahou-Rahou, where I witnessed earlier in the year an attack upon the Arabs by the above-named tribe, which ended in a complete victory for a handful—perhaps three hundred—mountaineers over ten times their number of Arabs, who were, too, better armed and mounted, while the Sari were on foot. A great quantity of spoil—women, jewellery, animals such as horses, mules, donkeys, &c—was carried away by the successful mountaineers, who left only two dead, while some seventeen of the Arabs were killed.

There is no reason why Europeans should not travel over this road from Wazan to Fez. I found the natives most hospitable, but on account of their, in most cases, never having seen Europeans, great care must be taken not to give offence in any way. The country is pretty and there is plenty of sport, but the road is impracticable in winter, on account of the mud and flooded state of the river. However, in summer it is one of the most enjoyable districts in Morocco.

Summary of Recent Pendulum Observations in Russia.

By E. DELMAR MORGAN.

IN 1884 the Russian Geographical Society decided on taking in hand a series of pendulum observations at a great number of stations, in order to investigate the distribution of gravity in Russia. The necessary pendulums were ordered of Repsold, at Hamburg, and the clock of Messrs. Hohwü, at Amsterdam. With these, preliminary observations were made by M. Lenz, at Berlin and Pulkova, in order to establish a connection with those hitherto made in Europe and Asia, notably by Bessel, Savitch, Lenz, Smyslof, Basevi, Heaviside, Tsinger, Stebnitzky, and Kuhlberg. By the end of 1886 matters were so far advanced as to allow of the projected scheme being begun, and Lieut. Wilkitzky, of the Imperial Navy, undertook the difficult task of making the necessary observations in Nova Zembla, the most advanced station towards the north, and at Archangel. Having familiarised himself with the use of the instruments at Pulkova, under the direction of M. Lenz, M. Wilkitzky started on the 18th (30th) June, 1887, for his destination. A schooner was placed at his disposal by the Minister of Marine, to transport him and his instruments from Suma, on the White Sea, to

Nova Zembla. In a fascicule* recently issued by the Society, the first of a new series on the Distribution of Gravity in Russia, the results of his work are published.

The apparatus consists of three pendulums oscillating $\frac{3}{4}$ second, and furnished with agate knife-edges. Two of them, Nos. I. and II., weigh respectively 1958 and 2053 grammes; the third, No. III., only 1055 grammes. Each pendulum consists of a copper cylindrical tube, to both ends of which are attached similar cylinders—one solid, the other hollow—enabling the reduction to a vacuum to be almost entirely eliminated, though the pendulum is swung in the air. A full series of oscillations comprises observations of the pendulums in four positions:—

1. Heavy end below, face in front.
2. " " above, " "
3. " " above, " behind.
4. " " below, " "

In each of these positions eight coincidences with the clock were observed; but since, when the heavy weight is above, the diminution of the amplitudes is twice as rapid as with the heavy weight below, an initial amplitude is again given to the pendulums in the former of these positions after the first four coincidences. Thermometer readings were taken at the beginning, middle, and end, those of the barometer only at the beginning and end, of each series: the amplitudes were noted in the middle between two consecutive coincidences. The length of the pendulum was observed at Nova Zembla and Archangel.

But, although M. Wilkitzky's determinations are absolute in character, they are only relative in reality; before and after his expedition he made two complete determinations at Pulkova of the length of the seconds' pendulum. Here the rate of the clock was deduced by comparison with Kessels' star clock at the observatory, showing an infinitesimally small probable error.

The observing station on Nova Zembla is in lat. $72^{\circ} 22' 33'' \cdot 3$, and long. 3 hrs. 30 m. $50 \cdot 1$ sec. east of Greenwich; that at Archangel is in lat. $64^{\circ} 34' 16'' \cdot 5$, and long. 2 hrs. 42 m. 4 sec. The observatory at Pulkova is in lat. $59^{\circ} 46' 18''$, long. 2 hrs. 1 m. $18 \cdot 8$ secs.

At the first of these stations four complete series of oscillations, at the second three, were observed. The rate of the clock by Hohwü was deduced by comparison with nine chronometers, and these were rated by observations for time with a transit instrument; independent observations to find the time by the sun were also taken by means of Repsold's vertical circle. The height of the observing station at Nova

* "Materialy dlia izuchéniya raspredéléniya sily tiajesti v Rossii. Nabliudeniya nad kachaniyami povorotnykh mayatnikov Repsolda proizvedenniya na Novoi Zemlé i ov Arkhangel'ské," by A. Wilkitzky. Published in the 'Zapiski,' vol. xxiv, No. 1.

Zembla is 7·3 metres (23·95 feet), that of Archangel 5·5 metres (18 feet), and Pulkova 247·6 feet above mean sea-level.

The results are as follows:—

The definite value of a single infinitely small oscillation, T , is for the two pendulums:—

	No. II.	No. III.
At Pulkova (initial)	$0''\cdot7499441 \pm 14\cdot8$	$0''\cdot7499169 \pm 23\cdot4$
„ Nova Zembla	$0''\cdot7496136 \pm 26\cdot1$	$0''\cdot7495878 \pm 33\cdot8$
„ Archangel	$0''\cdot7497935 \pm 11\cdot8$	$0''\cdot7497689 \pm 14\cdot6$
„ Pulkova (terminal)	$0''\cdot7499447 \pm 18\cdot2$	$0''\cdot7499140 \pm 23\cdot4$

Starting with these numbers, Wilkitzky finds the following values of the differences in length of the seconds pendulum:—

	No. II.	No. III.	Mean.
Nova Zembla — Pulkova ..	$+ 0\cdot8632$ mm.	$+ 0\cdot8549$ mm.	$0\cdot8591 \pm 63$
Archangel — Pulkova ..	$+ 0\cdot3856$ „	$+ 0\cdot3739$ „	$0\cdot3797 \pm 36$

And adopting for the length of the seconds pendulum at Pulkova the value determined by Stebnitzky, 994·8384 mm., he obtains the following:—For Nova Zembla, 995·6975 mm.; Archangel, 995·2185 mm.

These results give the following values of the length of the seconds pendulum in English measure:—

Pulkova	(lat. $59^{\circ} 46'$)	39·1672 inches.
Archangel	(„ $64^{\circ} 34'$)	39·1822 „
Nova Zembla	(„ $72^{\circ} 23'$)	39·2010 „

In the preparation of this brief note I have been kindly assisted by General J. T. Walker, late Chief of the Trigonometrical Survey of India, who has given an account of the pendulum observations in India with two differential pendulums, the property of the Royal Society, and also with two Repsold pendulums, obtained on loan from the Russian Imperial Academy of Sciences for the purpose of connecting the Indian with the Russian operations; see vol. v. of the 'Account of the Operations of the Great Trigonometrical Survey of India.' He has also given an account of recent pendulum observations to connect the observatories at Kew and Greenwich, which is published in the 'Transactions of the Royal Society,' vol. clxxxi. (1890), A., pp. 537–558). I also desire to call attention to an able treatise on the same subject by Commandant Defforges, entitled "Sur l'intensité absolue de la Pesanteur," published in the 'Journal de Physique' (June, August, and October 1888).

GEOGRAPHICAL NOTES.

Exploration of the Tibetan Borderland of China.—Mr. A. E. Pratt has recently returned to this country from his many years' exploration, as a naturalist, of the Upper Yang-tsze and the central and western parts of the province of Sze-chuen. The last year of his labours was spent in the mountains and upper valleys between Wa-shan and Ta-chien-lu, on the borders of Tibet, where he explored many remote districts out of the beaten tracks of recent travellers, and made interesting discoveries. He has brought home, amongst his other collections, a magnificent series of photographs of the scenery and people.

Exploration of the Black Sea.—Prof. Voeikof, at a recent meeting of the Society of Friends of Science of Moscow, communicated some results of the scientific exploration of the Black Sea in the Russian gunboat *Tchernomoretz* in June and July 1890. The mean depth in the basin is 6000 feet. The minimum depth (below 600 feet) was found in the north-west region, bounded by a line passing from Varna in Bulgaria to Eupatoria, on the west coast of the Crimea; and the maximum depth, 7365 feet, in the central part, between the Crimea and Anatolia. The surface temperature varies from 72° F. in the centre of the basin, to from 75° to 77° on the west and east. At a depth of from 29½ feet to 174 feet, the temperature was only 57° towards the south coast, 54° in the centre, and 52° in the north and near the west and east shores. The variation of temperature in the Black Sea is very characteristic at depths exceeding 180 feet. At this point the thermometer marks only 45°, but then the temperature begins to rise, and at a depth of 6000 feet it is 49°. In other seas, in mean latitudes, the temperature diminishes regularly from the surface to the bottom, or rather below a certain depth it remains invariable (55° for the Mediterranean). Another peculiarity of the Black Sea is, that at a depth of 450 feet, traces of sulphuretted hydrogen are found, the proportion of which increases so rapidly that it becomes quite sensible at 600 feet, and at 940 feet and under, it renders animal life entirely impossible. At that depth were found only the semi-fossil shells of certain molluscs characteristic of the brackish water of the lagoons of the Black Sea and of the Caspian. They are the remains of the Pontic fauna which inhabited the Black Sea at the Pliocene epoch, when this basin, still separated from the Mediterranean, and with a depth of only 3000 feet, contained water of but feeble salinity. At the opening of the Bosphorus, the waters of the Mediterranean would make their way into the Black Sea and lead to the disappearance of the ancient fauna. The sulphuretted hydrogen, then, is only one of the products of the decomposition of these ancient organisms, the elimination of which takes place very slowly owing to an immobility almost absolute of the water at a certain depth.

The Black Sea receives annually, by way of the Bosphorus, only 1000th part of the total volume of water in the basin, and, consequently, it will take 1000 years to completely renew the whole contents of the basin. It is thus easy to understand the slowness with which the deep waters participate in the circulation of the liquid mass.

The Timan Expedition.—Our Honorary Corresponding Member General Venukof has favoured us by communicating the following notes by A. Chernyshef on the Timan expedition of 1890, together with a map showing the routes and stations fixed astronomically. The full geological and geographical materials obtained will be published later, the present being merely a brief outline of the work done. The region lies in the far north of European Russia, within the Arctic circle, and is known to geographers as the Malo-Zemelskaya, or Timan-skaya tundra, the special home of the semi-nomadic Samoyedes, if these people can be said to have a home. This tundra extends from the mouth of the Pechora, in a north-westerly direction to the coast of the Arctic Ocean, its length being about 270 miles and its breadth from 130 to 140 miles. Through the centre of this tract a series of low hills runs from north to south, but for the most part the region in question is composed of wide plains abounding in moss, the favourite food of the reindeer; it is intersected by rivers and studded with lakes full of fish. In a country such as this communications are very difficult, and it is only by providing beforehand a number of reindeer that the traveller can expect to be able to move from place to place. What, then, must have been the disappointment of the leader of this expedition when he learned that the Samoyede owner of the herd he was on the point of hiring had taken fright and would have nothing more to do with him. They started from St. Petersburg about the end of April, and early in May reached the mouth of the Pinega. This river had opened, but several others were still ice-bound. However, M. Chernyshef and his companions had not to wait long before the so-called "Russian," or southern wind blew and speedily broke up the ice. They were now able to reach the Péza, a tributary of the Mezen, and cross the watershed, dragging their boats and baggage by hand to the Tsylma of the Pechora system. Having secured the services of a good Samoyede guide to the village of Piosha they finally decided upon their plans of exploring the tundra. These underwent a considerable change, for having originally intended entering from the east they now made up their minds to begin on the west. Their route lay by Kosma and the Kosminsky lake, where they were fortunate in hiring reindeer to take them to the system of the Piosha; this too gave them the opportunity of studying the geology of the so-called "Kosma rock," a range of hills extending in a meridional direction west of Kosma. At Piosha they divided their party; Messrs. Lébedef and Sergéyef descended the Piosha to the sea, then followed the course of the Volonga, and finally, having surveyed this

river, examined the sea-coast and the rivers joining it, while M. Chernyshef ascended the Volokova, an affluent of the Piosha, crossed the watershed between this river and the Sula lake, and by the river of this name to Kotkina, making in this way a complete section of the system of parallel ridges, concerning which nothing was previously known. At Kotkina fresh supplies were obtained, the expedition being reinforced by the accession of two members, and a new start made. Instrumental surveys were made of the Indiga and the lakes of the same name, the Sorina and the Sula by two of the parties, while a third, including M. Chernyshef, went towards the west to see more of the tundra and then to the sea-coast. By the 8th(20th) August all the members of the expedition arrived safely at the village of Velikovitchny on the Pechora, having terminated their researches in the tundra. No attempt was made to extend the survey to the Bolshezemelsky (Great Land) tundra, a far more extensive region to the east of the Pechora, as time would not allow of doing more. According to the accounts of the Samoyedes, this Great Land tundra would present entirely new features as compared with those usually represented on maps. Early in September there is a marked fall in the temperature and communications with the Pechora are cut off. M. Chernyshef brought the last news of this land that would reach the rest of Russia till the winter sledging was established in November.

Sir R. Sandeman's Tour in Baluchistan.—Sir Robert Sandeman, accompanied by several officers, among whom is Mr. Tate, of the Survey Department, and an escort, has started on a tour through the southern states of Baluchistan, the main objects of the expedition being the settlement of the Panjgur district, the opening of the old *Kafila* routes between Panjgur and Persian Seistan, and the promotion of direct intercourse between Kej-Mekran and Southern Persia. The only difficulties in the way of this are said to be the tribal jealousies, which Sir Robert hopes to allay satisfactorily. A letter to the *Pioneer* says that the expedition had a hospitable reception at Las Beyla on 26th December. The town is not large, with a population of about 5000. The Jam Sahib, who now occupies the position of a protected chief under the British raj, has about 300 infantry, 50 cavalry, and four guns, which are kept for saluting purposes. The infantry uniform is copied from that of our Baluch battalion, and the soldiers are armed with the Snider carbine and native swords. The expedition expected to reach Panjgur about the middle of January.

Survey Work in Upper Burma.—In Upper Burma several exploring expeditions have been organised to take place during the present field season, all of which will be accompanied by Survey officers. Major Hobday accompanies a party starting from Senbo, a little to the north of Bhamo, proceeding along the Irawadi as far as the junction

of the two main streams, Miliká and Mè-ka. After following the course of the Miliká for some distance, the party turns east to the Mè-ka, and thence works southwards towards Bhamo. Another party, accompanied by Lieutenant Renny-Tailyour, R.E., starts from Lashio, in the Northern Shan States, in order to explore the country to the east; and two others, each of which will be accompanied by a sub-surveyor, have been arranged, one starting from Lashio and proceeding via Theinni across the Salween to Kokang, and westwards to Namkam; and the other, starting from Bhamo and going north-east across the Taiping river to the Kachin villages of Sale, thence returning southwards towards Namkam. Captain Long, R.E., and Lieutenant Gordon proceed with another party from Senbo to Mogaung, and thence by a northern route to the Endawgyi lake and hills west thereof. Afterwards the party will cross to the head of the Kawkine valley, and follow the course of the river down to the Irawadi.

Captain Grombchevsky's Expedition.*—Captain Grombchevsky has now returned to St. Petersburg, and on the 10th(22nd) January last, delivered a lecture before the Geographical Society in that city on his explorations. From a report of this, kindly sent us by General Venukof, we learn that the severe weather experienced by the expedition in north-western Tibet in December-January 1889-90, proved too much for the endurance even of the Cossacks. With extraordinary difficulty they reached some warm springs on the Yurung-kash. Here a blizzard set in and the guide refused to advance farther. Leaving all their baggage behind they were obliged to retrace their steps as best they could, many of their horses having succumbed and the men being all frostbitten. Before recrossing a pass 19,000 feet high, to which Captain Grombchevsky gave the name of "Russian Pass," their hopes of safety were indeed slight. But summoning up all their remaining strength and taking advantage of the usual lull in the tempest before daybreak, they crawled rather than marched to the summit of the pass, and were saved. Returning to their starting-point, Shahidula, after eleven days of constant exposure on the plateau where the elevation was never below 17,000 feet, the expedition was completely disorganised. Fortunately for them the acting Russian Consul at Kashgar lent Captain Grombchevsky a sum of money enabling him to refit and start afresh. His difficulties, however, were far from ended, for after a pleasant week passed with Colonel Pevtsov at Nia, he decided once more on attempting an entrance into Tibet, this time by Polu and the valley of the Keria. Here the Chinese authorities were too vigilant for him and he was threatened with expulsion by force if he did not leave within three days. The inhabitants of Polu now came to his rescue and supplied him with baggage animals, and porters. Thus provided he left Polu on the

* By Mr. E. Delmar Morgan. For previous notice of Grombchevsky's expedition see 'Proceedings R.G.S.,' 1890, p. 422.

5th(17th) May, and five days later was on the Tibetan plateau. But the season was not far enough advanced for travel at that elevation, the springs being all frozen and the snow unmelted. The abrupt change of climate from the warmth of Keria to the cold of Tibet, was excessively trying for all, men and beasts, and some of the baggage animals died. Notwithstanding this a considerable tract was visited and mapped. This part of Tibet was found to bear a close resemblance to the extreme western portion visited the previous winter, consisting of the same sandy-saline wilderness, intersected by low ridges of hills, forming deep hollows filled with extensive lakes. The elevation, however, is a little lower (16,000 feet), and there is much more grass and more wild beasts, particularly yaks, met with in large herds. A road leads through this region to the inhabited parts of Tibet, only difficult for three days' march, i. e. by the bed of the Kurab, afterwards easy enough. It is, however, only practicable from July to September. As the expedition had no means of existing on the plateau till warmer weather set in they returned to Polu, and then made their way to Khotan, where they met the influenza, which did not spare this part of Asia, and attacked Captain Grombchevsky and all his companions. July, August, and September were devoted to the exploration of the Tiznaf or central course of the Yarkand Daria and the eastern slope of the Kashgarian range, localities almost unvisited by Europeans. M. Grombchevsky was enabled to collect a vast amount of information on the inhabitants of this country, and has communicated this to the Society in a separate memoir. At the end of August he was at Yarkand, where he met for the second time with Captain Younghusband, in command of a well-equipped expedition sent by the Government of India to Kashgar. From Yarkand the Russians went to Kashgar and returned to the Great Alai by the sources of the Markan-su, re-entering Russian territory. All the scientific materials and collections have been placed at the disposal of the Imperial Russian Geographical Society.—We propose in a subsequent number giving further details.

Captain Van Gèle's Explorations on the Mobangi.—News has reached the 'Mouvement Géographique' of some of the results of Captain Van Gèle's explorations on the Mobangi, in which he has been engaged for more than a year. Van Gèle confirms the observations of M. Crampel with reference to the great bend of the river above the Zongo rapids; it should be shifted about half a degree further to the north than its position on Van Gèle's first map. On the present expedition Captain Van Gèle was well supplied with instruments, and his companion, Lieutenant Le Marinel, was able to make a series of observations for latitude, which correct the first sketch of the course of the river. The longitudes were calculated by chronometer, after the longitude of the port of Banzyville (on the south bank of the Mobangi), determined directly by lunars, the result being long. E. from Greenwich 21°

24' 27", N. lat., 4° 18' 28". From other observations made by Lieutenant Le Marinel, it follows that the Mobangi in its most northerly course reaches 7' beyond the fifth degree N. lat. It takes here a great bend towards the north-east between two masses of hills forming the series of rapids described by Grenfell, and passed by Van Gèle for the first time. There are no tributaries of importance at this part of the course of the Mobangi, so that the waterpartings between it and the Shari on the one side and the Congo on the other approach very close to the river. Immediately above the bend the Mobangi receives four affluents on its right bank, two of which are important, the Koangu and the Kotto, possibly the lower course of the Foro and Engi, described in the upper part of the course in about 7° N. lat. by Lupton Bey. According to latest accounts Van Gèle and Le Marinel, in the two small steamers *En Avant* and *A.I.A.*, were continuing the exploration of the Mobangi and its upper branches. The Mbomo had been ascended to the town of Bangasso, 4° 48' N. lat., and 23° 7' E. long. On the Makua the expedition had advanced to the fall of Movungu, 23° 4' E. The Mbile, an affluent of the Mbomo, has also been surveyed in its lower course as far as the rapids which bar navigation. Several new stations had been founded, and the health of the explorers and the men was good.

An Expedition to the Juba River.—The Italian Society for Commercial Geographical Studies in Africa has decided to send out an expedition to explore the Juba river. The expedition will be under the leadership of M. U. Ferrandi, who has resided for many years on the Red Sea coast. The main object of the expedition will be to ascertain whether the Juba affords a practicable trade route to the southern tributary states of Abyssinia. One result will doubtless be to show conclusively whether the river Omo forms the headwaters of the Juba, or whether it flows south-west into Lake Rudolf, as maintained by Borelli and Teleki.

Meteorological Observations in German New Guinea.—Dr. A. Supan comments in the current number of Petermann's 'Mitteilungen' on the results of the meteorological observations which have been taken for the past four years at three German stations on the north-eastern coast of New Guinea. The results show that here, as in many other parts of the tropics, the periodical distribution of rainfall depends upon the position of a place in regard to the prevailing winds. In this region rain comes generally with the north-west monsoon and in the southern summer, and the table of rainfall at Hatzfeldt Haven shows, as might have been expected, its monthly maximum (14·88 inches) in the summer. Finsch Haven is, on the other hand, sheltered from the monsoon, but lies open to the trade wind, which reaches its greatest development in the southern winter, and strikes the east side of Huon Gulf and of the

peninsula which juts out north of it. Thus the monthly maximum of rain at Finsch Haven (21.85 inches) falls in July. The north-east coast, although not so directly swept by the trade wind as the east coast, is not altogether outside its influence. Thus we find here a secondary maximum of rainfall in July, when the trade wind is at its height. The amount of annual rainfall and number of "rainy days" at the three places are as follows:—Hatzfeldt Haven, 97.83 inches and 139 rainy days; Constantine Haven, 116.69 inches and 158 days; Finsch Haven, 113.66 inches and 174 days.

The Laughlan Islands.—In one of his recent despatches, Sir William Macgregor, the Administrator of British New Guinea, gives an account of his visit in July last to the small but interesting group of islands called by the natives Nada (the Laughlan Islands of the charts). These islands lie off the south-east coast of New Guinea in lat. $9^{\circ} 20'$ S., and long. $153^{\circ} 35'$ E., and are placed on a reef in the form of a horseshoe, open towards the west. The diameter of the lagoon thus contained is from four to five miles. There is no part of them more than two or three yards above high water mark. They are all covered by trees, coco-nut, casuarina, and the usual vegetation of Pacific islands. They have, however, little or no soil, and the food locally obtained is practically confined to coco-nuts and fish. The native population of Nada is, according to a resident trader, 169. They are of the ordinary Papuan type, and many of them speak a smattering of English. In manners and customs generally they resemble the natives of Murua and of the Trobriands. These islands appear to be very healthy; they have plenty of fresh water, and from the sea present a very picturesque appearance.

New Geographical Magazine.—The new geographical magazine which we announced in a recent issue as forthcoming has now appeared; the two first numbers are before us. Its title is 'Goldthwaite's Geographical Magazine,' being published (monthly) by Messrs. Goldthwaite, of New York. The editor is Mr. Cyrus C. Adams, of the Brooklyn Institute. The magazine is essentially popular. The articles are comparatively short, and attractively written. There is a profusion of well-executed illustrations, many of them having been already used in other connections. The maps are mostly sketch-maps in the text. In the first number we have such articles as "The Great Selkirk Glacier," by C. M. Skinner; "Railroads pioneer the Way," by Cyrus C. Adams; "A Chinese Map of China;" "Negroes in South American Woods;" "Recent Explorations in New Guinea;" "The First Scientific Observer in Greenland," by M. F. Johnstrup; and "Does the Gulf Stream warm Western Europe?" by Cyrus C. Adams; an account of Dr. Holub's recent expedition to South Africa; an article on the Mount St. Elias expedition; and other similar articles. There are also a "Young Folks' Geographic Corner;" "Hints for Teachers;" notes, gossip,

notices of books, &c. The contents are thus varied enough, and the articles generally brightly written. In the second number there are one or two articles of a somewhat higher type: such as "The Inland Ice of Greenland," by R. E. Peary; "The Nicaragua Canal," by J. C. Hurston; "In the Depths of the Amazon Basin," by Dr. Ehrenreich; "Popular Mistakes about the Sahara." Every one must wish well to the new enterprise, the only one of its class in the English language.

REPORT OF THE EVENING MEETINGS, SESSION 1890-91.

Fifth Meeting, 9th February, 1891.—The Right Hon. Sir M. E. GRANT DUFF, G.C.S.I., &c., President, in the Chair.

ELECTIONS.—*Alexander Charles Allan, Esq., C.E.; Rev. William Hibbert Binney; Kenric Edmund Brodribb, Esq.; John Clark, Esq.; Henry Perryman Cornish, Esq.; Vivian Ellis, Esq.; Archibald Findlay, Esq.; William Ellerton Fry, Esq.; Rev. Patrick John Gaughren; Boyd Horsburgh, Esq.; G. J. Litton, Esq., B.A.; John Marriott, Esq.; James A. Nicolls, Esq.; James Edge Partington, Esq.; John Compton Pyne, Esq.; William Gair Rathbone, Esq.; D. G. Wilson Rumsey, Esq.; Percy Whitaker Ryde, Esq.; Sir Robert Sandeman, K.C.S.I.; General Houtum Schindler; William Shepperson, Esq.; F. S. Philipson Stow, Esq.; Sugden Sutcliffe, Esq.; James Backhouse Walker, Esq.; Richard Hamel Wedekind, Esq.; C. H. Weatherly, Esq.; William Fischer Wilkinson, Esq.*

The paper read was:—

"Messrs. Jackson and Gedge's Journey via Masai Land to Uganda." By E. G. Ravenstein.

The paper, which was compiled from the reports and itineraries of the two travellers on the expedition carried out under the direction of the Imperial East Africa Company, will be published, with map, in the April number of the 'Proceedings.'

PROCEEDINGS OF FOREIGN SOCIETIES.

Geographical Society of Paris.—December 5th, 1890. M. le Comte DE BIZEMONT in the Chair.

VOYAGE UP THE RIVER MONO, WEST AFRICA.

M. A. d'Albca forwarded an account of a short journey made by him, when he was acting as the Administrator of Grand Pope and Agne, into the country of Tado. He ascended the river Mono up to Hunkeme (lat. 6° 50'), the extreme limit of navigation, and proceeded overland to the village of Tune, lying some 20 miles to the north-east. The country is wooded and well cultivated; the plantations of oil-palms and coco-nut trees were observed to be of recent growth. The chief of Tune informed the traveller that he was the first white man who had set foot in the village. Abomey, the capital of Dahomey, lies some 20 miles to the east of Tune.

THE BAYAGAS, DWARF PEOPLE OF THE FORESTS OF THE OGOWÉ.

A letter was read from M. Paul Crampel, the explorer of the Ogowé basin, giving an account of the Bayagas, a diminutive people who inhabit the great forests

extending to the north of the Ogowé, and are probably nearly related to the Wam-buttis described by Stanley. The Bayagas live scattered among the M'fangs, to whom their relation is one of semi-servitude. When a M'fang chief becomes powerful enough, he surrounds himself with a band of these "Bohemians" of the forest; they become his hunters and ivory seekers. In return he supplies them with manioc and bananas. Changing their places of abode every four or five days, the Bayagas are not able to cultivate the soil. They are great hunters; the elephant is their principal game, their sole weapon of attack being a very sharp two-edged spear about 5½ feet in length. Physically there is a great contrast between the Bayagas and the M'fangs. The former are dwarfs compared with the latter, whose height is often from 5 feet 9 inches to 5 feet 11 inches, or more. The average height of the Bayagas is 4 feet 7 inches. They are stout, well-proportioned, and muscular. The colour of their skin is a yellowish brown. What strikes the observer most at first sight are the prominence of the superciliary arches, the great thickness of eyebrows, which are continuous, and the projection of the cheek bones. The neck is very short, the head set into the shoulders; chest broad and well developed; the arm strong and wrist stout; the legs crooked. The dominating characteristic of their physiognomy is an expression of fear. The traveller had not much opportunity of studying the women; he noticed, however, especially, the mutilation of their ears, the lobe of which is pierced by pieces of wood or ivory, and in this way is gradually enlarged until it touches the shoulder. The Bayagas, although polygamists, do not imitate their neighbours and masters, among whom a large number of wives is considered to be the greatest evidence of wealth. Among the Bayagas there is a paucity of married women, owing largely to the family organisation, which tends to prevent marriages. A man has often only one wife: the chief two or three. The family is "patriarchal." The chief (the patriarch) lives with his children and grandchildren; sometimes, but rarely, one of his brothers joins the community, which never contains any but blood relations. A young Bayaga, when married, stays with his wife's family, and he only has the right to return to his original community and remove his wife thither when he has a son, and when that son has killed an elephant. The son always remains with his mother's group to replace her. A Bayaga woman never marries any one of another tribe. The traveller does not think that the Bayagas, even in numbers, would venture to attack; but they are well acquainted with the art of defence. Their language is utterly incomprehensible to a stranger, even to the M'fangs.

— December 19th, 1890. M. DE QUATREFAGES, of the Institute, President of the Society, in the Chair.—This was the second general meeting of the year.—The proceedings were opened with an address by the President, which was followed by the annual report of the General Secretary, M. Ch. Maunoir, on the progress of geography during the year.—A paper was then read by M. Ch. Rabot, on his scientific mission to the Northern Ural and Western Siberia.

— January 9th, 1891. COMTE DE BIZEMONT in the Chair.

PROPOSED DRAINAGE OF THE ISLANDS IN THE RIVER KUBAN.

According to a communication made to a Russian journal by M. Müller Matt, a correspondent of the Society, the result of the careful investigations made by the order of the Government in the district of the Kuban is that the low-lying marshy islands, which are situated between the mouth of the Kuban and the western spurs of the Caucasus, are nothing but gigantic nests of crickets. These insects multiply with astonishing rapidity, and proceed thence upon their devastating expeditions into the neighbouring regions and the south of Russia. As long as the islands

remain in their present condition nothing can be done to combat these voracious pests; it is therefore proposed to turn the islands into dry land by means of a system of canal drainage. A Commission will visit the spot in the spring to make the necessary hydrographical studies.

M. BLANC'S JOURNEY IN CENTRAL ASIA.

Three letters were read from M. E. Blanc, giving news of his expedition. Writing on November 13th from Kashgar, where he had arrived after traversing the northern part of the Pamir from west to east, the traveller stated that he had visited Captain Younghusband in his winter quarters; the latter was waiting until the spring before proceeding to Chitral and Kafiristan. M. Blanc intended to cross the Tian Shan to Lake Issik-kul, whence he would descend the course of the river Chow, in order to verify by geological observations certain facts regarding the ancient beds of the Amu Daria.

NEWS OF M. FOURNEAU.

M. A. Fourneau wrote from Libreville, on November 10th, announcing his return to that town. He started from Lopé (Upper Ogowé) in September, and after a month's march reached the sources of the Bokowé, which, with the Como and Remboé, form the Gaboon. He was on the point of embarking for Loango, whence he intended to return to the Upper Congo and the Sangha.

DEEP-SEA INVESTIGATION IN THE PACIFIC.

M. Alph. Milne-Edwards communicated an extract from a letter from M. Agassiz, in which the latter stated that the Government of the United States had placed at his disposal the steamer *Albatross*, in order to make dredgings from Acapulco to the Galapagos Islands, and thence to Panama. The *Albatross* is a large vessel (1200 tons) and is fully equipped with the necessary appliances.

— January 23rd, 1891: Vice-Admiral VIGNES in the Chair.—The Chairman announced the constitution of the Bureau of the Central Commission for the present year, as follows:—President, Vice-Admiral Vignes; Vice-Presidents, MM. Cheysson and H. Duveyrier; General Secretary, M. Ch. Maunoir; Assistant-Secretary, M. Jules Girard.

A further letter from Kok-Münak (Siberia) was read, from M. Blanc, giving news of himself and other travellers. He had just arrived on Lake Issik-kul, having crossed the Tian Shan. He intended, after making an excursion in Siberia, to revisit Ferghana, and possibly the south of the Khanate of Bokhara. MM. Grum Grjimaïlo were at Su-chau at the beginning of September, and were preparing to return to Kuldja, and thence to Europe. (A communication from M. Venukof, read subsequently, announced their arrival in St. Petersburg.) M. Joseph Martin was also at Su-chau about the same date, where he was lying ill. Since January last, owing to sickness, he had only been able to travel from Lan-chau to Su-chau.

COLONEL PEVTZOF'S EXPEDITION.

M. Venukof announced the return to Russia, on the 16th of the present month, of Colonel Pevtzof and his companions. He summarised the chief results of the expedition as follows: 5000 miles of topographical surveys; fifty determinations of geographical positions; magnetic observations at ten points; vast zoological, botanical, and geological collections, for the transport of which more than forty camels were required. M. Bogdanovitch, a member of the expedition, attributed the failure of the party to penetrate into the interior of Tibet to two causes:—(1) the fact that operations were commenced in the west of the country, where the topographical and

physical geographical difficulties are very great, and in this way the pecuniary means and the strength of the explorers were exhausted in ineffectual efforts; (2) a quantity of arms and ammunition were carried to no purpose, instead of a little more money. — In conclusion, M. Jules Garnier read a paper on his journey in North America.

St. Petersburg Academy of Sciences.—The yearly report of the St. Petersburg Academy of Sciences, by Professor A. A. Strauch, contains mention of the following works of geographical interest which were done or published during the year past by the members of the Academy. In geology, Dr. Rogon published a very interesting monograph in German upon the Jurassic fishes of Ust-Balei, in East Siberia. The Jurassic vegetation of that region has already been described by Oswald Heer in 1876 and 1880, while the fossil insects of the same locality have been made the subject of monographs by Bauer, Ganglbauer, and Redtenbacher. The six species of fishes now described by Dr. Rogon have an additional interest, on account of their belonging to four genera intermediate between the Mesozoic Ganoids and the *Teleostei*; so that a further exploration of the numerous fresh-water Jurassic deposits which are scattered over Siberia and Central Asia promises to be rich in interesting data for geology and physical geography. M. Tchersky's researches into the Post-Pliocene mammalian fauna of Siberia offer still more interest to the geographer. The extremely rich collection of fossils (more than 2500) which was brought in by Dr. Bunge and Baron E. Toll from the islands of New Siberia, the mouth of the Lena, and the banks of the Yana river, permitted M. Tchersky to prepare a most valuable work, which contains, first, a full and interesting sketch of the progress of our knowledge of the Post-Tertiary mammals of Siberia, with detailed indications as to the spots where the seventy species which we now know have been found. Next, he gives a description of the Post-Pliocene deposits of Siberia and their fauna, as well as of the caves of the country and the fossil fauna they contain. An enumeration of the fossils collected by the expedition comes next, and the work is concluded by a systematic description of the twenty-five species which can be established. That work, due to the pen of a specialist well acquainted with the subject, acquires special importance for the geographer in connection with the work by Mrs. Mary Pavlova, recently published (in French) in the Bulletin of the Moscow Society of Naturalists, upon the origin of the common horse and the subsequent migrations of its ancestors.—In botany, the report of the Academy mentions, in the first place, the researches of Prof. K. Maximowicz into the floras of Tibet and Mongolia, based upon the rich collections brought home by Prejevalsky. An analysis of the Tibetan flora, of which nothing was previously known, has brought Professor Maximowicz to the conclusion that it is extremely ancient and that it has been chiefly composed of immigrants from the Himalayas and the mountains of Mongolia. But there is also, in the Tibetan flora, a considerable percentage of endemic species. Plants immigrating from China followed, and they were followed in their turn by our common northern—we may say North European—plants. The distinction established by Prejevalsky between the true plateau of Tibet in the west and the Alpine tracts in the east holds good for the flora as well. The species which are distinctive of the eastern border-ridges reach the plateau, but they do not spread over its western part. As to the flora of Mongolia, it represents a continuation, to some extent impoverished, of the flora of South Siberia, so that Prof. Maximowicz intends to complete the work he now published by another work upon the Siberian flora according to recent information.—The collections brought home by Prejevalsky have also busily employed two zoologists. Mr. Bichner published last year the first fascicule of a description of Central Asian mammals (the Rodent genera *Ellobius*, *Siphneus*, *Dipus*, and *Lagomys*); and Prof. Th. Pleske has brought

out a description of the bird families *Sylviidae*, *Timeliidae*, and *Accentoridae*. One new genus, named *Lophobasileus*, deserves special mention, as it appears to be an intermediate link between the genera *Sylvia* and *Regulus*, and contributes a good deal to explain the affinities between different families of birds. M. Bichner described also a small but very interesting collection of mammals brought in by MM. Potanin and Berezovsky from Kan-su. The fourth fascicule of the 'Ornithographia Rossica,' by M. Th. Pleske, was also published last year.—In anthropology we find mention of a work by Prof. Tarenetsky upon the anatomy of forty-four Aino skulls obtained from the island of Saghalien. A comparison of these skulls with Mongolian skulls brings the author to doubt that the Ainos belong to the Mongolian race.—Several works of interest have been undertaken or completed in the department of ethnography. Thus we learn with pleasure that Professor Salemann undertook to bring into order the most valuable unpublished MSS. which were left by Sjögren. Most of them deal, as might be expected, with the Finnish tribes, but some relate to those of the Caucasus. A work of great interest has been in hand for a number of years by Dr. Bilenstein, and is now going to be published by the Academy, together with a series of maps. It deals with the present and past limits of the extension of the Letts and the Lettish-speaking population. Documents dated from the thirteenth century permitted the author to settle the very intricate boundaries of the territory which the Aryan Letts inhabited among the Ural-Altaic Cours and Lives.—Prof. Vasilieff visited this year West Siberia, and had there an opportunity of studying the Solon and Shibi languages, the relations of which to Mongol and Manchu are not yet exactly determined. He mentions also in his preliminary report the quite unexpected fact of Chinese emigrants settling in considerable numbers on Russian territory between Lake Issyk-kul, Djarkent, and Pishpek. Thousands of Mussulmen Chinese have already settled in that territory, coming from all parts of China, even the remotest, such as the frontiers of Burmah, in the province of Yun-nan. He also studied the moral and social aspects of Buddhism among the Kalmucks. The printing of Prof. Vassilieff's 'Geography of Tibet,' and his second work, on Buddhism, is progressing. Finally, M. Katanoff, who was sent out by the Academy to Northern China and East Turkistan for the study of Turkish dialects, returned and brought home very rich materials relative to the Minusinsk Tartars and the Soyotes. M. Katanoff is himself a Sagai by birth, and the Sagais speak well the Soyote language. He wrote down (in W. Radloff's alphabet for the transcription of Turkish dialects) a very great number of most interesting tales, sayings, proverbs, and Shaman prayers in the Soyote language, which fully characterise both the language and the manners of life of that rapidly disappearing branch of the Turkish race. Notes on the phonetic differences between various Soyote dialects accompany the above—the whole of it having been prepared on the spot, while M. Katanoff lived among his kinsfolk, the Sagais. This work will be published in the ninth volume of Prof. Radloff's series of 'Specimens of Folk-Literature of Turkish Tribes.'

NEW GEOGRAPHICAL PUBLICATIONS.

(By J. SCOTT KELTIE, *Librarian* R.G.S.)

EUROPE.

Ball, E. A. Reynolds.—Mediterranean Winter Resorts: a Practical Handbook to the Principal Health and Pleasure Resorts on the Shores of the Mediterranean. London, L. Upcott Gill, 1888: 12mo., pp. 237, map and illustrations. [Presented by the Author.]

[Bremen.]—Die Freie Hansestadt Bremen und ihre Umgebungen. Festgabe, den Teilnehmern an der 63. Versammlung der Gesellschaft deutscher Naturforscher und Ärzte gewidmet vom Ärztlichen Vereine, Naturwissenschaftlichen Vereinen und der Geographischen Gesellschaft zu Bremen. Bremen, 1890: 8vo., pp. xii. and 432, portraits, plans, &c. [Presented by the Geographical Society of Bremen.]

Chaix, Émile.—Une Course à l'Etna. Genève, Imp. Aubert-Schuchardt, 1890: 12mo., pp. 60. [Presented by the Author.]

Corti, Siro.—Le Provincie d'Italia. Torino, G. B. Paravia & Co., 1890: 12mo.

These little volumes, averaging fifty pages each, deal with the various provinces of Italy in their geographical and historical aspects. Each contains one or more maps, besides a number of illustrations. Nos. 1-41 have as yet appeared.

Kiepert, H., and Koldewey, R.—Itinerare auf der Insel Lesbos. Berlin, D. Reimer, 1890: pp. 66. Price 4s.

This little work is what it professes to be—an itinerary, under the joint authorship of Heinrich Kiepert, and Robert Koldewey, whose names are a sufficient guarantee for the accuracy of the information it contains. There are two maps of Lesbos—one a general map, the other showing the distribution of vegetation, and of the land under cultivation. There is also a sketch-map of the district around Mytilini.

[Spain.]—Gran Diccionario geográfico, estadístico é histórico de España y sus Provincias de Cuba, Puerto Rico, Filipinas y posesiones de África. . . . Esta obra se publica bajo la dirección de D. Rafael del Castillo con la colaboración de notables escritores y artistas. Tomo I. Barcelona, Imp. de Henrich y Comp. 1889: 4to., pp. 752.

This is the first great production of the kind on Spain since the publication of Madoz' "Diccionario" in 1846-49. Judging from the present volume, embracing A—D, the work will be very comprehensive; the articles are of proportionate length, ample space being given to the more important places. The statistics, although somewhat old, are apparently the latest procurable. There are a few illustrations, chiefly of the people. A series of maps is also promised, including a general map of Spain, of the roads and railways, telegraphs, and of Cuba and Puerto Rico and the Philippines.

ASIA.

[Central Asia.]—A Journey in Khorassan and Central Asia. March and April, 1890. London, Hatchards, 1890: 12mo., pp. 101, map.

AFRICA.

Harris, George W.—"The" Practical Guide to Algiers. London, G. Philip & Son, [1890]: 12mo., pp. xix. and 174, map, plan, and illustrations. [Presented by Charles Trabuer, Esq.]

Jankó, [Dr.]—Das Delta des Nil. Geologischer und Geographischer Aufbau des Delta. Budapest, 1890: 8vo., pp. 131, 4 maps. Published by the Royal Hungarian Geological Institute. [Presented by the Author.]

Dr. Jankó has in this memoir given the results of a thorough study of the Nile Delta.

Dr. Jankó, who is Secretary of the Hungarian Geographical Society, was sent in the spring of 1888 by the Chamber of Commerce at Budapest to Lower Egypt. The memoir contains the geographical and geological results of his journey as well as an exhaustive monograph of the physical geography of the Nile Delta. The first part consists of a résumé of the inquiries made up to the date of the visit, on the geologico-geographical construction of the Delta; the author then points out all those questions which are unanswered by the different hypotheses, as well as all the facts which seem to be in contradiction of these.

He then gives a topographical description of the head of the Delta, which never moves northwards, only changing the character of its arms. Further, from a study of the various arms of the channel network, he demonstrates how the main arm proceeded westwards from the middle of the Suez channel towards Alexandria; the main arm having been in the Roman period the Pelusium, in the middle ages the Damietta, whilst at present it is the Rosetta arm.

Dr. Jankó thoroughly studied the girdle of lakes and the marshlands between them, and maintains from the geology of these swamps, that originally there was only one great lake inside the coast, the barrier of which existed before the Delta was filled up. Now it is divided up by wind-driven sand, and the separate portions are the lakes Mariut, Abukir, Edku, Burlus, and Menzaleh.

Dr. Jankó goes on to speak of the conditions under which the mouth of the river was formed. It was first a reef, then became through the deposition of alluvium an island, then the islands met, and thus were joined to the continent (Rosetta mouth). The progressive development of the reefs exists only at the Damietta entrance.

The author adduces facts and observations to prove that in Lower Egypt only the tertiary formations are sinking, whilst the present (alluvial) formations are distinctly rising.

The north boundary of the Delta was originally not on the sea-coast, but on the south coast of the lakes, and there the building of the islands and the development of the Delta can be observed. These lakes are continually filling up, the islands grow, the depth of the lakes diminishes; there are already transformations observed since the time of Napoleon. An example of transformation is seen in the ground on which Alexandria is built.

The Delta is bordered at Cairo by mountains of the Eocene; the west side is Miocene. The sea-coast is old alluvial marine chalk (analysed by Dr. Jankó). The south part of the Suez channel consists of estuarial alluvium with the fauna of the Red Sea; the middle part of freshwater fluvial alluvium without any marine fauna; whilst the northern part, from Ballah Lake to Port Said, and from there along the lakes to Alexandria, inside of the old alluvial marine chalk, consists of estuarial alluvium with Mediterranean fauna.

Price, W. Salter.—My Third Campaign in East Africa. Second edition. London, W. Hunt & Co., 1891: 8vo., pp. xi. and 339, map and illustrations. Price 6s. [Presented by the Publishers.]

A record of a missionary's experiences in various parts of East Africa during 1888 and 1889.

Whitford, John.—The Canary Islands as a winter resort. London, E. Stanford, 1890: 12mo., pp. viii. and 150, maps and illustrations. Price 7s. 6d. [Presented by the Author.]

A descriptive account of the Canary Islands by one who has resided there for four months.

AMERICA.

Ballivian, M. V.—*Exploraciones y Noticias Hidrográficas de los Ríos del Norte de Bolivia.* Publicados por Mantel V. Ballivian. 2º P^{te}. *Diario del Viage al Madre de Dios* hecho por el P. Fray Nicolás Armentia, en los años de 1884 y 1885, en calidad de Comisionado para explorar el Madre de Dios y su distancia al río Acre y para fundar algunas misiones entre las tribus Araonas. La Paz, 1890: pp. 138.

Our Bolivian correspondent, Señor Ballivian, has done another useful service to geography by publishing the narrative of Father Armentia during his voyage on the Beni and Madre de Dios. There is a map of the course of the Beni in the number of the Society's 'Proceedings' for April 1883, illustrating the voyage of Dr. Heath, but the Madre de Dios is very little known. The latter is, however, the river of greatest volume, and receives all the streams flowing down the eastern slopes of the Andes in the Peruvian departments of Cuzco and Puno. The object of Father Armentia's expedition was to explore the Madre de Dios, and to establish missions among the Indians. Leaving the capital of Bolivia in May 1884, he reached the banks of the Beni, travelling by way of Pelechuco and Apolobamba. He found the difficulties very great, owing chiefly to the want of hands, and his boatmen deserted on every opportunity; but he received all possible assistance both from the few government officials, and from the collectors of india-rubber who have small establishments at various points on the river. Father Armentia gives a deplorable account of the present state of the missions in Moxos. That of Reyes has been abandoned, owing to the difficulty in maintaining a population. Although there are large herds of cattle, there are no means of exporting produce, and the prices of all the necessities of life have risen fivefold since the visit of Keller. On October 17th, Padre Armentia, accompanied by Don Antonio Vasquez and his brother, who were established at a station on the Beni, called Ivon, reached the mouth of the Madre de Dios, where its width was 984 yards. Armentia continued to ascend the river for twenty-eight days, until the 14th November, making excursions into the interior to ascertain the distance of the river from other parallel streams, and receiving help from the friendly Indians. His furthest point was in 12° 56' S., a point which, according to Colonel Church's map, would be nearly 200 miles from the mouth of the river. The descent was performed in ten days. During 1885, Father Armentia was engaged in an endeavour to collect the Araona Indians in communities, a beneficent undertaking which at first gave promise of success. They assembled at his invitation, and began to fell trees and clear ground with enthusiasm. Armentia gives a most interesting account of these Indians, whose skins are so white that he suggests their possible descent from some of the followers of Juan Alvarez Maldonado and Gomez de Tordoya who entered this region in about 1565, and of whom only three ever returned.*

The good work of Father Armentia was checked, and eventually had to be abandoned owing to an epidemic which raged with such violence that the surviving Indians were terrified, and fled back to their old life in the forests. Unusual floods also obliged the india-rubber collectors to abandon their stations and retire into Moxos. Father Armentia returned from his labours by descending the Madeira and Amazon. It is to be hoped that he will not be disheartened, and that he will renew his efforts to explore these most interesting regions, as well as to ameliorate the condition of the Indians. His narrative is very interesting, and shows him to be a good sportsman, a vigorous backwoodsman, and a scientific explorer, as well as a conscientious and warm-hearted missionary. He is the author of a separate work on the navigation of the Madre de Dios which is also in the Society's library.—[C. R. M.]

Finck, Henry T.—*The Pacific Coast Scenic Tour.* London, Sampson Low & Co., 1891: 8vo., pp. xiv. and 309. Price 10s. 6d. [Presented by the Publishers.]

This "is an attempt," we are told in the preface, "to give a general and impartial view of the whole Pacific coast, from San Diego to Sitka." It thus

* See 'Garcilaso de la Vega, Comm. Real.,' Hakluyt Society's translation, ii. p. 271.

embraces portions of Oregon and Washington, about which comparatively little has been written.

The author portrays some of the grandest scenery to be found in these States, as well as in Lower California and Alaska, he also gives his readers descriptive accounts of trips across the Canadian Pacific, through the Yellowstone Park, and the Grand Cañon of the Colorado. The author has also a deal to say with reference to the climate of the Pacific Coast region. The volume is embellished with a number of illustrations, most of which are reproduced from photographs, which give a good idea of the chief points of interest described.

Norton, Charles Ledyard.—A Handbook of Florida. London, Longmans & Co., 1891: 12mo., pp. xxxii. and 380. Price 5s. [Presented by the Publishers.]

In the present volume, both intending settlers as well as tourists in Florida will find much information in a convenient form. The introductory matter, including a few hints to travellers, is followed by a brief account of the principal events in the history of Florida, from its discovery in 1497 to the middle of 1889. The first section of the handbook proper is devoted to sketches of the several counties, accompanied with maps. In the other sections travelling routes are described in general and in detail. The general plan divides the State into five sections, as follows:—the Atlantic coast; the Gulf coast; Middle or Inland Florida; Subtropical Florida; West Florida. Some miscellaneous information is appended, dealing with the cultures, native races, average temperature, rainfall, population, and game laws, &c., of Florida.

[The River Plate.]—The Conquest of the River Plate (1535–1555). I. Voyage of Ulrich Schmidt to the Rivers La Plata and Paraguai. From the original German edition, 1567. II. The Commentaries of Alvar Nuñez Cabeza de Vaca. From the original Spanish edition, 1555. With Notes and an Introduction, by Luis L. Domínguez. (Hakluyt Soc. Publ., No. lxxxi.) London, 1891: 8vo., pp. xlvi. and 282, map. [Presented by the Hakluyt Society.]

Thompson, Edward H.—Extracts from Letters on Explorations in Yucatan. [Presented at the Semi-Annual Meeting of the American Antiquarian Society, April 25th, 1888.] 8vo., pp. 10.

AUSTRALASIA.

Moore, John Murray.—New Zealand for the Emigrant, Invalid, and Tourist. London, Sampson Low & Co., 1890: 8vo., pp. xiii. and 253. [Presented by the Author.]

The emigrant, the invalid, and the tourist will find much interesting matter in the present volume. Chapters ii. and v., dealing with the climates and thermal springs of New Zealand, are the fruits of the author's nine years' professional work in the colony, and are therefore of special value. Other portions of the book treat of—Migration, Emigration, and Immigration; the Maoris and their Customs; the City of Auckland; the Hot Lakes and Terraces, and the West Coast Sounds; the Volcanic Eruption of Mount Tarawera; Self-government; Public Works and Institutions; Productions and Industries; Social Life; and the author's own professional experiences. There are four maps.

GENERAL.

Drude, [Dr.] Oscar.—Handbuch der Pflanzen-Geographie. — Bibliothek geographischer Handbücher herausgegeben von Prof. Dr. Friedrich Ratzel. Stuttgart, J. Engelhorn, 1890: 8vo., pp. xvi. and 582, maps. Price 14s.

[French Colonies.]—Les Colonies Françaises, Notices illustrées publiées par ordre du Sous-Secrétaire d'État des Colonies. Le Gabon-Congo;—La Guinée, Obock. Paris, Maison Quantin, 1889–90: 12mo., maps and illustrations.

[Geodetic Institute Publications.]—Veröffentlichung des Königl. Preussischen Geodätischen Institutes und Centralbureaus der Internationalen Erdmessung. Die Schwerkraft im Hochgebirge insbesondere in den Tyroler Alpen in geodätischer und geologischer Beziehung. Von F. R. Helmert. Berlin, P. Stankiewicz, 1890: 4to., pp. 52. [Presented by the Director of the Institute.]

Izvestija Imperatorskago Russkago Geographicheskago Obshestva. Tom. xxvi., 1890. Vypusk ii.—Proceedings of the Imperial Russian Geographical Society. St. Petersburg, 1890.

This number contains an article by L. I. Podgaetsky on the Murman coast of Lapland, its nature, industries, and importance. 'Murman' or 'Norman' is the name given to the northern coast of the great peninsula of Kola with an extent of upwards of 700 miles from Sviatoi Noss (Holy Cape) to the river Voriena (Jacob's Elf), forming the boundary between Russia and Norway, between long. 30° and 42° E., and lat. 68° and 70° N. Ships bound for the White Sea, after rounding the North Cape, pass within sight of its high rocky cliffs, forming a continuation of the Scandinavian hills. The Kola Peninsula is usually divided into an 'eastern' or 'Russian,' and a 'western' or 'Norwegian' part, two distinctive names well known to the fishermen and coasters visiting it every summer. The author's researches were confined to the eastern or Russian half. He finds there many indications of a recent glacial epoch, in the rounded outlines of the hills and their cupola-shaped summits, in the steep rocky sides of the valleys and numerous fiords, in the *roches moutonnées* and boulders, all pointing to the presence, within a comparatively recent period, of an ice-cap which detached huge icebergs into the ocean.

Many of the fiords form deep and admirably sheltered havens for vessels. It may be remembered that in one of these the first English navigator of these seas, Sir Hugh Willoughby, anchored his ships preparatory to passing the winter, when he and all his men were frozen to death. Another observation made by M. Podgaetsky is that the sea is apparently receding, in other words, that the coast is rising, and this process is taking place at a comparatively rapid rate, speaking, of course, geologically. Indeed our author goes so far as to hazard the opinion that the whole of Ribachi, or Fishers' Peninsula, has been raised above the surface since the glacial period. With regard to the hitherto untouched mineral resources of the Kola Peninsula, there seems no probability of their being worked in the immediate future. The climate of the Murman coast is equable; the cold, owing to the influence of the warm equatorial current, is never very severe, and some winters it actually thaws and rains. On the other hand, the summers are cold, and snowstorms have been known to occur in July. But the chief interest of this coast lies in the fishing and barter trade. The author shows how, since the beginning of the nineteenth century, when Norway, combined with her sister state Sweden, left off intermeddling in political affairs and devoted herself to the well-being of her population, the Norwegian fisheries sprang into new life. Monopolies were abolished, free trade was inaugurated and three ports established. Beneficial as these measures were to the Norwegians, they appear to have had for their result the diminution of the Russian fisheries. The coasting vessels leaving the White Sea ports with cargoes of flour and timber went to Norway for their return cargoes of fish, and the Russian Murman fisheries began to decline. Assisted by all the appliances and arts of modern science, the Norwegian fishers rarely fail in securing a harvest; their enterprise and hardihood know no bounds, and lately they have been successful in hunting seals at the mouth of the White Sea. A great contrast to the activity shown by Norway is the supineness of the Russians. They abolished their White Sea fleet and naval establishments some years ago; the Murman fisheries are in the hands of monopolists, and the economical state of their population is very bad. The Russian *pomor*, or seafarer, is no match for the high-cultured Norseman; he wants fishing centres, telegraphs, roads, &c., so that, on landing on the Murman coast, he should not feel himself isolated completely from all his belongings. To these and such-like considerations M. Podgaetsky calls attention in his article.

The next paper in this number is a journey to the Pechora country in 1889 by Th. M. Istomin. The author joined the expedition of M. Chernyshef, of which we give an account at p. 172 of the present No. of the Proceedings, as ethnologist. He also undertook to correct, from his observations, existing maps, and collect whatever of archaeological interest the region afforded. The results are recorded in his paper. N. Andrussof writes 'on the necessity of deep-water researches in the Black Sea.' The author attempts in it to place, in an attractive light, the various problems connected with an investigation of the depths and bed of the Black Sea. In consequence of this article, as we learn from a footnote by the editor, a vessel of war was assigned by the Ministry of Marine for the purpose, and Baron F. F. Wrangel, the hydrologist, and M. Andrussof were ordered to accompany it. Lastly we have 'On the Winds at the town of Prejevalsk,' by Y. J. Korolkof, with a diagram.—[E. D. M.]

Longstaff, George Blundell.—Studies in Statistics, Social, Political, and Medical. London, E. Stanford, 1891: large 8vo., pp. xvi. and 455. Price 21s. [Presented by the Author.]

Among the more important papers of geographical interest are the following:—The Growth of Population in England, with two maps; the Migrations of the People in the Nineteenth Century, with a map and two diagrams; the Growth of New Nations—the United States, with five maps—Canada—South America—South Africa, and Australasia, with a diagram; the Growth of Modern Cities; the Population of London and its Migrations, with a map.

Mushkétov, J. V.—Zemletriaseniya ikh kharakter i sposoby nabludeniya.—Earthquakes, their character and methods of observing them. St. Petersburg, 1890: pp. 47, with 18 illustrations in the text.

Since the disastrous earthquake at Verny in 1887, the Russian Geographical Society has turned its attention to the subject of seismology. It appointed a commission of inquiry with the view of establishing systematic observations in the regions peculiarly subject to those phenomena. Hitherto the severest earthquakes have been confined to the Caucasus, Turkestan, Semirétchia (or the Seven river province) and Trans-Baikalia—and instructed M. Mushkétov to draw up a handbook for observers. This is the small work under review, in which the author has endeavoured to give, as briefly as possible, the chief elements of the science, to distinguish between the various kinds of earthquakes and the causes which produce them. Lastly, he describes the instruments in use for observations of this nature. The questions to be answered by observers, and a list of eighty stations, are given at the end.—[E. D. M.]

Tchihatchef, P. de.—Études de Géographie et d'Histoire Naturelle. Florence Imp. de Louis Niccolai, 1890: 8vo., pp. 263. Price 12s.

The subjects treated of in this volume are:—Petroleum in the United States and in Russia; the Sahara; the Gobi; Tibet; the Aral-Caspian depression; and the Merv Oasis. There is neither a table of contents nor an index.

Travel, Adventure, and Sport from "Blackwood's Magazine." Nos. XI. and XII. Edinburgh and London, W. Blackwood & Sons., 12mo. Price 1s. each. [Presented by the Publishers.]

No. XI. contains, among other things, Shiraz to Bushire, by Capt. Claude Clerk, C.I.E.; A Recent Ride to Herat; and, In Search of the *Eira*, by H. Swire, R.N. No. XII. includes an article on Kashmir, by Andrew Wilson, and an account of Travels in Circassia, by Laurence Oliphant.

Wagner, Hermann.—Festrede im Namen der Georg-Augusts-Universität zur Akademischen Preisverteilung am 4. Juni 1890. Göttingen: 4to., pp. 30. [Presented by the Author.]

This comprehensive and instructive address by Professor Wagner touches, among other subjects, on the position and conception of geography, and its relation to other branches of learning.

Wagner, Hermann.—Geographisches Jahrbuch, XIV. Band, 1890. Herausgegeben von Hermann Wagner. Erste Hälfte. Gotha, Justus Perthes, 1890: 8vo., pp. 192. Price 4s. 6d.

This first part of the Jahrbuch contains contributions on the progress made in investigating geographical names, by Professor Egli; the results of scientific exploration and travel in Australia, Polynesia, and Africa, by Dr. Hahn, in North America, by Dr. F. Boas, and in Central and South America, by Dr. Sievers; progress of geographical and topographical knowledge of the old Greek world, by Dr. Gustav Hirschfeld; progress in cartography (1st part), by Dr. S. Günther.

Yeats, John.—Commercial Instruction. Map Studies of the Mercantile World, Auxiliary to our Foreign and Colonial Trade, and illustrative of part of the Science of Commerce. London, G. Philip & Son, 1890: 8vo., pp. xxvii. and 336, charts. Price 4s. 6d. [Presented by the Publishers.]

— The Golden Gates of Trade with our Home Industries; introductory to a study of Mercantile Economy and of the Science of Commerce. London, G. Philip & Son, 1890: 8vo., pp. xxxii. and 354, map. Price 4s. 6d. [Presented by the Publishers.]

The following Works have also been added to the Library:—

Bilgrami, Syed Hossain, and Willmott, C.—Historical and Descriptive Sketch of His Highness the Nizam's Dominions. 2 vols. Bombay, 1883-84: 8vo., pp. (vol. i.) iv., viii., and 433; (vol. ii.) 760 and xviii., map.

[Ptolemy.]—Géographie de Ptolémée. Reproduction Photolithographique du Manuscrit grec du Monastère de Vatopédi au Mont Athos, exécutée d'après les clichés obtenus sous la direction de M. Pierre de Sévastianoff, et précédée d'une introduction historique sur le Mont Athos, les monastères, et les dépôts littéraires de la presqu'île sainte. Par Victor Langlois. Paris, Didot, 1867: 4to., pp. viii. and 117, and cviii. of facsimile text and maps. Price 3*l*.

The famous monastery on Mount Athos has been a storehouse of ancient manuscripts, notwithstanding the havoc wrought by the Turks. When the Archimandrite Porphyry Upensky visited the monastery in 1846 he found a manuscript containing the geographies of Strabo and Ptolemy, as well as the Periplus of Arrian. Unfortunately no steps were taken at the time to secure a complete copy of the manuscript; so that when M. Pierre de Sévastianoff in 1857 visited the monastery for the purpose of copying the manuscript by photography, he found that during the lapse of ten years it had undergone serious mutilation. The Periplus of Arrian as well as several of the maps belonging to the Ptolemy had vanished, in addition to the text of the seventh and eighth books. Of what remained of Ptolemy M. Sévastianoff made a facsimile copy, which has been faithfully reproduced in this volume. The date of the manuscript is stated to be the end of the twelfth century or the beginning of the thirteenth. The writing is not very clear, but any one familiar with Greek would probably have no difficulty in reading the reproduction. The maps, of which there are forty, are coloured, and though, as might be expected, rude, are exceedingly interesting. No attempt is made in the introduction to explain their origin. Were they made by the copyist after the details given in the text, or are they reproductions of maps of a much earlier date? A solution of the point would be of much interest. The introduction to the text is mainly occupied with a history of Mount Athos.

Rousdon Observatory, Devon. Vol. vi., Meteorological Observations for the year 1889, made under the superintendence of Cuthbert E. Peek, M.A., F.S.A. London, 1890: 4to., pp. 19. [Presented by C. E. Peek, Esq.]

NEW MAPS.

(By J. COLES, *Map Curator*, R.G.S.)

EUROPE.

Deutschen Reiches.—Karte des —. Herausgegeben von der kartographische Abtheilung der königlich. preuss. Landes-Aufnahme. Scale 1:100,000 or 1·3 geographical miles to an inch. Sheets: 155, Pölitz; 395, Kohlfurt; 396, Bunzlau; 422, Liegnitz; 502, Neuerburg; 503, Prüm; 504, Cochem. Price 1s. 6d. each sheet. (*Dulau*.)

France.—Carte Spéciale des Chemins de Fer de la —, publiée d'après les documents officiels par la Librairie Chaix, Paris. Scale 1: 800,000 or 11 geographical miles to an inch. 4 sheets. Price 1l. 2s. (*Stanford*.)

Keilhack, Dr. R.—Das Abflusslose Gebiet und die Wasserscheide auf der Baltischen Seenplatte. Von Dr. K. Keilhack. Scale 1: 850,000 or 11·6 geographical miles to an inch. Petermann's 'Geographische Mitteilungen,' Jahrgang 1891, Tafel 4. (*Dulau*.)

London.—Stanford's Library Map, of London and its Suburbs. 24 sheets, on the scale of 6 inches to a mile (stat.). London, Edward Stanford, 1891. 24 sheets. Price 1l. 11s. 6d.

This is a new edition of a very useful map, which, owing to the numerous changes that have taken place in London and its suburbs since it was last issued, had in several places become out of date, and needed correction. This has been very carefully done, and it is probably the most accurate map of London of its scale published.

Norge.—Topografisk kart over Kongeriget —. Scale 1: 100,000 or 1·3 geographical miles to an inch. Sheets: Nos. 14 A, Kongsberg; 20 D, Søndre Solør; 21 A, Varaldsjöen; 21 C, Røgden; 45 D, Edö; 49 C, Frøerne; 51 D, Sörli; 54 C, Trones; 56 A, Vikten; 56 B, Leka; 57 B, Namsvandet. Udgivet af Norges Geografiske Opmaalning, 1890. Price 1s. 2d. each sheet. (*Dulau*.)

Schwarzen Meer.—Übersichtskarte der Tiefsee-Forschungen im —, im Jahre 1890. Scale 1: 4,500,000 or 62·5 geographical miles to an inch. Petermann's 'Geographische Mitteilungen,' Jahrgang 1891, Tafel 3. Gotha, Justus Perthes. (*Dulau*.)

Spain and Portugal.—Carte des Chemins de fer de l'Espagne et du Portugal. Scale 1: 2,400,000 or 32·8 geographical miles to an inch. Extrait du Grand Atlas, publié par la Librairie Chaix. Paris. Price 3s. (*Stanford*.)

ORDNANCE SURVEY MAPS.

Publications issued since the 15th January, 1891.

25-inch—Parish Maps:—

ENGLAND AND WALES: **Lancashire:** VI. 16, X. 8, 12, 15, 16, XI. 16, XV. 11, XVI. 2, 15, 16, 4s. each; XXII. 2, 5s.; 5, 4s.; 9, 5s. **Yorkshire:** CVIII. 2, 4, 6, 7, CIX. 2, 3, 5, 7, 8, 10, 11, 12, 13, 14, 4s. each; 16; CCXV. 4, 2s. each; 9, 4s.; 13, 3s.; CCXVI. 16, CLXVIII. 7, 8, 15, 16, CLXIX. 1, 4, 4s. each; 8, 12, 3s. each; 13, 4s.; CLXXXVI. 1, 3s.; 7, CCVII. 4, 8, CCX. 10, 13, CCXI. 3, 7, CCXXII. 3, 4s. each; 5, 5s.; CCXXIII. 12, CCXXVI. 8, CCXXVII. 1, 5, 9, 11, 13, 14, 15, 4s. each, CCXXVIII. 15, 5s.; CCXLI. 9, 4s.; CCXLI. 2, 5s.; CCXLII. 1, 2, 8, 10, 13, 14, 16, CCLVI. 1, 6, 8; 4s. each.

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(*Stanford, Agent*.)

AFRICA.

État Indépendant du Congo.—Carte de l' — et de l'Afrique centrale, dressée par J. Du Fief, Secrétaire Général de la Société Royale Belge de Géographie. 1890. Bruxelles, G. Severeyns. Price 1s. (*Dulau.*)

AMERICA.

Argentine Republic.—Mapa General de los Ferro-Carriles de la República Argentina. Segun los Datos hasta la Fecha Octubre 1 de 1890. Construido por el Ingeniero Civil E. Martini, Gefe de Oficina Tecnica de la Empresa Lucas Gonzalez & Cia. Propiedad de la Litografia de José Ruland. Buenos Aires. Scale 1: 1,800,000 or 24·6 geographical miles to an inch. Price 1*l.* 16s. (*Dulau.*)

This is a good map of the Argentine Republic, on which all railways in working order, as well as those under construction, or projected, are laid down. The latter are, however, so numerous that it can hardly be seriously contemplated to commence them until the resources of the country have been further developed. The map is accompanied by a list of railway stations, the positions of which can be easily found by a system of index letters which are also printed on the margin of the map. With the exception of a note on the manner in which the railways in operation are to be distinguished from those which are in course of construction, or projected, there is no explanation whatever of the signs and abbreviations which the author has used. This omission detracts from the value of the map, as some of the abbreviations and symbols are quite unintelligible; as, for instance the symbols which in common use indicate positions fixed by triangulation. These are scattered all over the map, in some places in close proximity to one another, and in such a manner that it is highly improbable they can be intended to represent triangulation stations. In other respects the map is clearly drawn, and will be useful for reference in matters not connected with railway enterprise.

Kiepert, H.—Mapa General del América Meridional por —, Profesor de la Universidad y miembro de la Academia de Ciencias de Berlin. Edicion segunda. Libreria de Dietrich Reimer, Berlin, año de 1890. Scale 1: 10,000,000 or 137 geographical miles to an inch. Price 4s. (*Stanford.*)

CHARTS.

Norwegian Charts.—Specialkart B 43. Specialkart over den Norske Kyst fra Grundene til Glæslingerne og Abelvær, udgivet af Norges Geografiske Opmaalning. Kristiania, 1889. Corrected to 1891. Scale 1: 50,000 or 1·4 inches to a geographical mile. (*Dulau.*)

United States Charts.—No. 1186. Harbor of San Juan del Norte or Greytown. From a survey in 1888 by W. J. Maxwell, U.S.N., of the Nicaragua Canal Construction Company, with additions in 1890 by the Officers of the U.S.S. *Kearsarge*, Commander H. Elmer, U.S.N., commanding. Published Jan. 1890, at the Hydrographic Office, Navy Department, U.S.A. Henry F. Picking, Captain U.S.N., Hydrographer. Extensive corrections Dec. 1890. Price 2s.

ATLASES.

Colombia.—Atlas Geográfico é Histórico de la República de — (Antigua Nueva Granada), el cual comprende las Repúblicas de Venezuela y Ecuador, con arreglo á los trabajos geográficos del General de Ingeniero Agustin Codazzi, ejecutados en Venezuela y Nueva Granada. Construida la parte cartográfica por Manuel M. Paz, Miembro de la Sociedad de geografia de Paris, y redactado el texto explicativo por el Doctor Felipe Perez. Todo de orden del Gobierno Nacional de Colombia. Paris, 1889: Imprenta A. Lahure. Price 2*l.* 15s. (*Dulau.*)

The maps contained in this atlas are based on those of Gen. A. Codazzi, and compiled by Manuel M. Paz; they are twenty in number, thirteen of which illustrate the political changes which have taken place in the area now embraced in the United States of Colombia, from the time of the Spanish Conquest to the present date. The remaining sheets of the atlas contain geological and physical maps, a map of the world on Mercator's projection, and a plan of the City of Bogotá, with views of the principal buildings. The letterpress, which has been written by Dr. Perez, contains a large amount of statistical and general information, and, taken as a whole, this atlas is a very useful work of reference for the United States of Colombia.

Vidal-Lablache, M.—*Histoire et Géographie*, 137 Cartes—248 Cartons. Atlas Vidal-Lablache, Maître de Conférences de Géographie à l'École Normale Supérieure. (L'Atlas complet paraîtra en 24 livraisons). Paris, Armand Colin & Cie. Editeurs. 2^e Livraison. Price 1s. 2d. (*Williams & Norgate*.)

The three first sheets of this issue contain historical maps, the subjects they illustrate being the history of the Hebrew nation, from the time of David to the time of Christ; the rise and decline of the ruling powers in Western Asia, from B.C. 800 to B.C. 400, and Ancient Greece. The political maps are those of Belgium and Holland, and Austro-Hungary, both of which are clearly drawn, and contain insets to illustrate subjects of interest. This is especially the case with the map of Austro-Hungary, on which, in addition to insets of the usual form, diagrams are given which show at a glance the proportion of each race to the total population, the movements in industry and commerce, agricultural statistics, prevailing religions, &c. The remaining sheet is occupied by a physical map of Scandinavia, orographically coloured, which also contains insets and diagrams to illustrate the state of agriculture and commerce. At the foot of each map some well-written explanatory notes are given, which, though necessarily brief, are well adapted for the use of students.

The Map Room collection has received a valuable addition by the purchase of a complete copy of Vicomte de Santarem's fac-simile atlas, which contains seventy-eight plates, including the thirty published in his original work in 1842. It is furnished with a table of contents edited by Mr. Bernard Quaritch, of which only twelve copies were printed. This is a convenient addition, as the author gave no list or index for the arrangement of the sheets until shortly before his death, when he communicated to the '*Nouvelles Annales des Voyages*' (1855, vol. ii.) a classified list of the several maps, and it is upon this plan that Mr. Quaritch's has been prepared.

PHOTOGRAPHS.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. When purchased photographs are presented, it will be useful for reference if the name of the photographer and his address are given.

Plate I.





XIII
1891

PROCEEDINGS
OF THE
ROYAL GEOGRAPHICAL SOCIETY
AND MONTHLY RECORD OF GEOGRAPHY.

Messrs. Jackson and Gedge's Journey to Uganda via Masai-land.

By E. G. RAVENSTEIN.*

(Read at the Evening Meeting, February 9th, 1891.)

Map, p. 248.†

THE following is an account of the Imperial British East African Company's expeditions, which left Machako's, one of the company's stations (lat. $1^{\circ} 28' S.$, long. $37^{\circ} 7' E.$) on August 5th, 1889, under the leadership of Mr. F. J. Jackson. The expedition was charged with exploring a new road to the Victoria Nyanza, and with looking out for Mr. Stanley, who had been reported to have been seen in Ururi, a district to the east of the lake. It need hardly be remarked that this turned out to have been a false rumour.

When the expedition left Machako's, on August 5th, 1889, it numbered, all told, 535 men, including four Europeans (Mr. F. J. Jackson, Mr. Ernest Gedge, Dr. Mackinnon, and Mr. Martin), 445 pagazis, 51 askaris, 14 headmen, 2 interpreters, 13 servants, and 6 men in charge of 22 donkeys.

The Valley of the Athi.—After a short but terrible climb over the Ukamba hills, the explorers obtained a view over the broad plain which extends northward for some 30 miles, as far as the dark forest region of Kikuyu, and through the centre of which the river Athi takes its course. The whole of this grass land was formerly occupied by the Masai, but

* Prepared from the Reports of Messrs. Jackson and Gedge, by Mr. Ravenstein.

† The map accompanying this paper is a reproduction of Mr. E. Gedge's map: adjusted to Count Teleki's route as plotted by Lieut. Höhnel, to the latitude of Kwa Mumiya or Sundu, as determined by Mr. J. Thomson, and to the position assigned to Mengo on the Royal Geographical Society's map of Eastern Equatorial Africa. This adjustment has necessarily compelled several changes in Mr. Gedge's original map, a reduction of which is given as an inset. Mr. Gedge's altitudes, which seem trustworthy, have been retained. An enlarged map of the environs of Machako's, from a sketch by Mr. Latrobe Bateman, has been added. Mr. Bateman sighted a peak which he believes to have been the Kibo. He appears, however, to have seen Mount Meru, unless the position assigned to Machako's on Lieut. Höhnel's map is very far out.—[E. G. R.]

they have been driven out of it by the Wa-kamba and Wa-kikuyu. At the present time it swarms with game, including rhinoceros, harte- and wildebeests, gazelles, zebras, buffaloes, rabbits, ostriches, and water-fowl. The Athi, where crossed on August 8th, was very low, consisting, in fact, of a series of pools, varying in size, but all abounding in fish, hippopotami, and crocodiles. Firewood was plentiful along its course.

Towards the north the plain was strewn with fragments of volcanic rocks, which occasionally cropped up to the surface; many ant-heaps were dotted about, bushes made their appearance, until at length the edge of the forest was reached, and the caravan entered Kandarino, the first district of Kikuyu.

Kikuyu.—Friendly relations were quickly established with Kamiri, the chief of this district, and the Wa-kikuyu freely offered food for sale. The whole of Kikuyu, as far as Mianzini, a distance of 50 miles, was originally a forest-region, but at the present day the whole of the interior has been brought under cultivation, the forest forming a protecting belt all round it. The country is undulating, and rises gradually from 5000 to 8000 feet. The soil is rich, the population dense, and food cheap and plentiful, every inch of the ground being under cultivation. The houses of the inhabitants are thickly dotted about the hills, in groups rather than in villages; they are large and more comfortable than those of the Wakamba. The Masai dress is worn by most, both men and women, and a knowledge of the language of the Masai is general. Most of the men are armed with shields and spears; others carry bows and poisoned arrows. The country is divided among a large number of petty chiefs. The people, though excitable, were friendly to the last, and *hongo* was demanded only on one occasion, but refused. This friendly attitude may possibly have been due to cowardice in the face of so formidable a caravan. The products of agriculture are varied, and of excellent quality. Indian corn, mtama, wimbi, sweet potatoes, yams, bazi, beans, banana, and sugar-cane, all flourish in immense quantities. The tobacco is very superior to that grown on the coast. A few cattle are kept, but sheep and goats are more plentiful. On uncultivated spots the common bracken grows to a height of six or eight feet, whilst in the open glades between these bracken-brakes might be found red and white clover, dandelions, forget-me-nots, and other plants familiar to English eyes.

The progress through this country was slow, owing to numerous steep gorges which had to be crossed, and to the slippery condition of the paths. These difficulties increased as the broad forest belt to the west of the cultivated country was entered. There the donkeys suffered terribly, and several of them died from exhaustion, as the forest afforded them nothing to eat except ferns and mosses. The weather at the same time was cold and rainy, and scarcely ever did the rays of the sun cheer the travellers.

The forest was magnificent. Orchids were found in great quantities on the trees, and from every branch hung rich festoons, whilst the ground was literally carpeted with ferns and mosses of great variety. In the glades grew brambles and other familiar plants. In the midst of this dense forest the caravan came upon a party of Wandorobo elephant hunters. They were an ugly, pale-skinned, ill-fed looking lot. Their women, however, looked healthy and exhibited considerable strength, and they gladly carried the loads of the donkeys who had died. Like the Wakamba, they carry their loads resting on the small of the back, and supported by a loose leather strap placed across the forehead.

Mianzini (8650 feet).—At Mianzini the caravan stayed from August 23rd to September 10th, in order to accumulate a store of food which would carry them as far as Sotik. A Swahili caravan, under Jumbi Wawan, a Pangani man in the service of Mr. Stokes, was encamped in the neighbourhood, and some traders attached to it sought to make mischief by informing the Masai that Mr. Jackson had come to fight them and rob them of their cattle. Mr. Jackson succeeded fortunately in establishing friendly relations with the Leibon, or medicine-man, who had known Mr. J. Thomson. The weather was for the most part delightful as long as the caravan stayed at this place, but the cold was severe, the thermometer registering on one occasion 6° F. below freezing-point. The neighbourhood offered few resources. Besides partridges there was little to shoot, although elephants and buffaloes are said to be plentiful in the neighbouring forest and bamboo-thickets at other seasons. A foraging party was therefore sent to the north-east, into Kikuyu, and immediately after its return with sixty-five loads of flour and one of tobacco, a start was made for the westward.

Kinang-gop.—A short march over grass land led to the edge of the plateau, which afforded a splendid view across the plain of Kinang-gop, with Lake Naivasha (6302 feet) in its bosom, and the steep escarpment of Mau bounding the horizon. Having descended to the plain, the camp was pitched at Lanjora, in the midst of a juniper forest. This grazing region was found to have been almost deserted by the Masai owing to the drought, and only to the west of the lake were Masai in larger numbers met with. Passing through an acacia bush with occasional grassy openings, the northern margin of the lake was reached on September 11th. The swampy ground near the lake, Mr. Jackson conceives to be well suited for the cultivation of rice. The lake harbours hippopotami, and is the resort of water-fowl and waders, whilst its vicinity affords excellent sport—zebras, gazelles, and Embala antelopes being met with. Having skirted the northern extremity of the lake, the caravan struck west (September 16th), and passing several Masai kraals, arrived on the river Dabejon. At one of these kraals Mr. Jackson met a son of Mbatian, the famous Leibon of the district west of Mount Meru, and from him received a present of three bullocks, the first and only present ever

received from the Masai. The path from these Masai villages to the top of the escarpment led over a succession of rough stony hills covered with grass, and through wooded gorges, the streams of which flowed in the direction of Lake Nakuro.

Ragata Yangovi.—On reaching the top of the Mau escarpment, the character of the country changed completely. There lay before the travellers an undulating plain, for the most part grass-clad, crossed by numerous rivulets which took their course through boggy hollows; also dense clumps of magnificent juniper trees. The rains must be very heavy in this upland region; rain and thunder always came on, with a bitter cold wind, about 10.30 a.m.

The Wa-kuavi, who formerly inhabited this plateau, have been driven forth by the Masai, but the sites of the kraals can still be recognised by large round patches of very green grass and a large species of nettle. The few Wa-ndorobo who were seen ran away on the approach of the caravan. Game is plentiful; buffalo were seen in large herds, also zebras, elands, hartebeest, and duyker antelopes, as also many elephant tracks.

On September 27th the caravan entered the dense forest which intervenes between the "Elephant plain" and Sotik, the first district of Kavirondo, and marched through it for six days, struggling against the greatest difficulties; no regular foot-path existed, only elephant tracks, which crossed the forest in every direction. Fortunately a Wa-ndorobo was captured and compelled to serve as guide. The country proved exceedingly difficult, the numerous rivulets and rivers taking their course through steep gorges or through boggy hollows. Over three of these rivers (including the Guaso Nyiro and the Guaso Dabash) bridges had to be built. In several instances the donkeys had to be unloaded, so precipitous were the descents. Add to this that a cold drizzling rain fell almost continuously, and that food was running short. Only at intervals did the sun shine forth and lit up gloriously the gloomy gorges, the colossal trees of the forest, mixed with clumps of bamboos and a fine species of holly.

At last, when supplies of food had nearly become exhausted, the caravan made its way down a terribly steep hill and through dense bush to the Ngare Dabash, and having crossed this river, found itself in Sotik, and remained in camp September 29th–October 1st.

Sotik.—Sotik is a hilly, even mountainous country, intersected by numerous rapid but shallow streams. Originally the whole of it appears to have been covered with forest, but of this only patches remain now. The houses are scattered about on the hillsides, with the fields close by. Only "wimbi" is cultivated, but there are large herds of cattle, sheep, and goats. Honey of superior quality is plentiful and cheap. The natives are well made and good featured. The men have in part adopted the dress, shields, and spears of the Masai whose language is generally

understood, but many of them are still armed with bows and poisoned arrows. The married women wear a skin loin cloth, with leather straps ornamented with cowries passing like braces over the shoulders. Some of the girls go quite naked, whilst others wear a neat leather fringe in front.

On October 8th, some of the natives of Manjilalea, who followed the caravan in large numbers, kidnapped two boys, one of whom carried a load of chain, the most valuable article of barter in this part of Africa. Later in the day a rifle and other things were stolen. Mr. Jackson then seized two of the men, whom he sent as messengers to their countrymen, threatening to seize their herds unless the two boys and the stolen goods were restored. As only the rifle and a waterbottle were brought in by a friendly native, fifty men were despatched on the ensuing morning, and they effected the threatened seizure. On the 10th, parties of armed men followed in the track of the caravan, but were kept at a respectful distance by long shots. The river Sangao was crossed with difficulty, as the caravan had intentionally been taken to a place where its current is swift and deep, instead of to the regular ferry. Five bullocks were drowned in crossing this river. Eventually the two boys were set free, but only a few bits of the stolen chain were brought back, and attempts were made to decoy the cattle of the caravan by tempting them with a sweet-scented food especially prepared for such a purpose. The attitude of the natives continued to be hostile. Poisoned arrows were discharged, fortunately without doing any mischief, but a volley and a rocket quickly induced them to abstain from further pursuit.

Lumbwa.—On reaching the first camp in this country the people came in with offers of peace, and on the day after blood-brotherhood was made with the chief of Buleti, two puppies being chopped in two, an act symbolical of the fate of him who should first break the contract supposed to have been consecrated by this ceremony. Lumbwa, like Sotik, is a hilly country, intersected by several streams, but trees are scarce, and even bush is wanting in some localities. The people are of the same race as the Wa-Sotik, they keep cattle and goats, but except in the more densely peopled district of Burganese, do not appear to cultivate the soil to any extent. The natives were apparently friendly, and appeared to be gaining confidence. Nevertheless, when the last villages of Burganese had been left behind, and the caravan was descending a steep hillside covered with tall grass and loose stones, an attempt was made to "lift" the cattle; but after a short skirmish, in which two of them lost their lives, they desisted.

Lower Kavirondo.—On October 20th the caravan descended the stony hills, covered with grass and scrub, which separate Lumbwa from Lower Kavirondo, and camped in the district of Kach. The people there proved exceedingly troublesome, and a small caravan would hardly be safe among them. The men go about quite naked, but ornament their

heads with ram's horns or the horns of a reed-buck, sticking out from the side of the head, much like the people of Unyoro.* Others suspend from their foreheads the large curved canine teeth of the hippopotamus, cut and scraped quite flat, or they ornament themselves with the tusks of wart-hogs, the wings of birds, cylindrical blocks of wood, and even dead birds.

Some of the older men ornament the outer edge of their ears with eight or ten small pieces of brass, suspended to which is a large blue chiketi-bead. Bang is grown in large quantities. The men smoke it all day long, and are always in a half dazed state, or most aggressively noisy and boisterous. Their weapons are large cowhide shields and a mere apology for a spear, consisting of a stick, from eight to ten feet long, with a small blade of a few inches attached to it. Some also carry knives or swords.

The clothing of the married women is confined to a small fringe of twisted fibre in front, and a long tail of the same material behind. The unmarried women and girls go about quite naked. Various brass and bead ornaments are worn by both men and women, but none at all peculiar or uncommon. The villages are without exception protected by a stone or mud wall, with a deep trench in front. Mtama flour and a few pumpkins were all that could be obtained in the way of food.

On the following day, October 22nd, the caravan camped in the wilderness, and after the cool air of the uplands both men and beasts suffered terribly from the heat.

On October 22nd the caravan arrived at Sendege and camped under the trees by the side of the river Nyando, which is of considerable size, though very low at this season. The surrounding country is densely peopled and fairly well cultivated, although little else but mtama is grown. Many of the villages are protected by a tall euphorbia hedge. The people are just the same as at Kach, and, like them, addicted to the smoking of "bang."

Three marches through the densely-peopled districts of Kadibu and Kajulu brought the caravan to the Victoria Nyanza, at a point which can readily be identified with the head of Mr. Stanley's Ugowe Bay. A short distance before reaching the lake a swamp was pointed out to Mr. Jackson in which a large caravan of some 900 Swahilis was said to have been cut to pieces by the natives.

After leaving the lake the people became troublesome and aggressive, and when on the road between Kisumu and Sagami, with Mount Mnoro rising conspicuously to the right, the natives begun to stone the rear-guard, but were easily driven off. A more serious attack upon the caravan was planned for the following day, the 31st of October. The surrounding hills were crowded with men, and on reaching the district of Wasigui it was deemed prudent to take possession of a deserted

* Compare Baker's 'Albert Nyanza,' vol i., p. 80.

village, and to secure it against a night attack. The night passed over quietly, and on November 1st the caravan reached Wagemi, the last district of Lower Kavirondo, and was able to lay in a stock of provisions for the ensuing march through the wilderness.

Upper Kavirondo.—A three days' march through an uninhabited wilderness of tall tangled grass, very trying for both men and cattle, where trees were found only around some boggy hollows, brought the caravan to Kulu, the first village of Upper Kavirondo. Thenceforth the country grew more hospitable. The hills in the direction of the lake were covered with large boulders and patches of forest. Elephants and other game abounded.

The village of Mumiya (Kwa Mumiya), the successor of Sundu, was reached on November 7th, and the chief allotted to the caravan a corner of his village to camp in. Mumiya is still a young man. His influence hardly extends beyond the village in which he dwells, but might be extended, if a station were established there. Soon after arriving at this place the cattle belonging to the caravan were attacked by a lung disease, which killed them in the course of a few hours. Fortunately their carcasses found ready purchasers among the natives, who brought in large supplies of flour and potatoes. Curiously enough, this apparently infectious disease did not extend to the cattle of the Kavirondo people.

The environs of Kwa Mumiya abound in game, including elephants, and the river Nzoia swarms with hippopotami and crocodiles. Mr. Jackson and Mr. Gedge were fortunate enough to bag four elephants in a day, besides capturing a bull-calf, which was carried into camp, and thrived on milk and boiled potatoes, but unfortunately died six months afterwards of inflammation of the lungs brought on by wet and cold.

Letters from Mr. Stokes and King Mwanga reached Mr. Jackson's hands at Kwa Mumiya's, inviting him to come at once to Uganda, but for reasons which need not be entered into here, he deemed it wise to delay his departure, and to utilise the interval by making an excursion to the Baso Narok or Lake Rudolf.

An Excursion to Ngaboto.—As it was reported that no food was to be obtainable as far as Ngaboto, the greater part of the trade goods were left behind at Mumiya's in charge of two headmen and sixty invalids. The remainder crossed the Nzoia on December 10th into Kitosh, which is the principal slave and cattle-raiding ground of the Swahili and Arab traders. These traders settle down at a place like Mumiya's for several months, trusting for their support to the good natured and hospitable natives. During this time they make two or three raids into the Wanipi country, towards Masala. Having buried large stocks of ivory on their outward march at Njems or Kamasia, but not having a sufficient number of porters to carry it down to the coast, they return through Kitosh, stealing all the cattle as food and kidnapping all the women and

children they can. Their custom is to profess the greatest friendship for the people, and encourage the women and children to come into camp by giving good prices for their flour, &c., but at a given signal they secure all the women and children, and shoot down any man who may offer resistance. The Masai, too, and the Wa-Nandi, make raids into this unfortunate country. Mr. Jackson was enabled to restore to her people a woman who had been captured some time before by Abdalla bin Hamis, but notwithstanding this he was received with distrust. The villages were barricaded against him, and all offers to buy food were declined.

The country is fairly well cultivated, mtama and wimbi being the staple food, besides a few bananas. The cattle, which mostly belong to the Wa-kuavi, are much finer than those at Mumiya's, which is probably due to the country being higher and cooler, and the grass of a better quality. Iron ore is plentiful in places and worked by the natives, and used for hoes, &c., in preference to the iron-wire brought from the coast. Outside most villages there are one or two smelting furnaces. The path led through alternate patches of cultivation and bush, and over several streams, one of them fairly large with a rough native bridge thrown across. Wrecked, burnt, and deserted villages were passed every day, silent witnesses to the raids of Arabs and Swahili.

Leaving the inhabited country behind, the caravan on December 13th entered the wilderness, skirting the eastern slopes of Mount Elgon. The country is very undulating, and for the most part covered with thorn trees (Acacias), bush, and long grass, the latter burnt at this time of the year by the Wa-ndorobo of Elgon. Water is plentiful everywhere, in small streams, and delightfully cool. Game, when they passed, was rather scarce and wild; but during the wet weather, judging from the old tracks, the whole country must be alive with buffalo, &c., and a fair number of elephants. The latter were just coming down from Elgon, and Mr. Jackson and Mr. Gedge succeeded in shooting four. Unfortunately the Suk Wa-ndorobo, who hunt all over this district, kill indiscriminately every elephant they come across, even the smallest calves.*

On January 21, 1890, the expedition descended a rough and stony slope, strewn with pieces of white quartz, and arrived at the Angalul river, which rises in the crater of Elgon, and flows in a north-easterly direction to Lake Rudolf. This river was followed as far as Ngaboto, where Mr. Jackson came upon Count Teleki's route.

In its upper course, whilst traversing the districts of Karamojo and Turquel, the river flows through a plain covered with bush, aloes, and coarse grass, all burnt up at this time of the year, with no shelter except

* Game noticed between Kitosh and the river Angalul:—Elephant, rhinoceros, lion, zebra, giraffe, buffalo, wart-hog; hartebeest, waterbuck, wildebeest, eland, oribi, oryx (gemsbuck) and *Bubalus Senegalensis*.

in the narrow belt of sycamores, acacias, fig, and other trees which border its banks. Fish are plentiful in it, and had the expedition been supplied with fishing nets, they might have proved a valuable article of food. In the hilly country of Kirakow the river is called Suam, and before entering upon the barren and desolate plain of Ngaboto, it passes for a couple of miles through a deep cañon or gorge, which is quite impassable, and has to be avoided by climbing over the precipitous hills rising above it. In passing through the plain of Ngaboto the river loses itself in the sand, and water can be procured only by digging in its beds.

Except in the district of Kirakow, where the Wa-Suk living among the rugged hills keep cattle, goats, and donkeys, the whole of this region is uninhabited, and only frequented by hunters. Ivory is cheap, and small tusks, weighing about 15 lbs., were obtained for six strings of beads. The Suk Wa-ndorobo are hunters pure and simple, who kill the elephant with small spears, and catch buffaloes and other game in ingeniously contrived traps. When game fails them they eke out an existence by eating small rats, which swarm in thousands all over the plain, and are dug out of their holes by the women. These rats, tamarinds and other kinds of fruit, then constitute their only food.

The men, with the aid of a kind of fibre, grease and clay, convert their hair into a huge flat bag, which hangs down over their shoulders, and serves as a receptacle for their odds and ends. A strip of skin and a few strings of beads round the waist, with a thick ivory bracelet and armlet, together with a few brass rings in their ears, is all the dress the men wear. All carry a small oblong shield of buffalo or giraffe hide, with projecting corners, and are armed with a spear or two, which is used either for throwing or stabbing.* The women dress very decently in skins, with strings of beads and plain rings of brass wire round the neck and waist.

When the caravan, on January 11th, arrived at the junction of the Suam with the Ngaboto river, the natives there set up their war-cry, which much resembles the barking call of the zebra. Nevertheless, about fifteen men appeared soon afterwards, pointed out the usual camping ground for caravans, and promised to return with ivory. They never returned. When Count Teleki was in this district his men had been allowed to loot, and the natives evidently intended to revenge themselves upon the new comers. Two porters who had strayed from the camp were killed during the night. All hopes of being able to penetrate to Lake Rudolf were at an end, and as there were neither villages nor crops to destroy, the murders could not be avenged. Mr. Jackson, therefore, at once retraced his steps. A few natives came in to sell

* Game met with along the Angalul :—Lion, leopard (scarce), elephant, zebra, giraffe, buffalo, wart-hog, eland, hartebeest, waterbuck, oribi, Grant's gazelle, and *Neotragus Kirkii*. Guinea fowls abounded, and a small bustard was found in Kirakow, and there only.

ivory, but immediately left as soon as their business was done. On the evening of the 25th, when in the district of Turquel, a third porter was murdered; and a party sent out to punish the people in the vicinity, killed a couple of natives, and brought thirty-two women and children, together with six donkeys, into the camp. On the following day several men came to us for peace, but it was not deemed advisable to release the prisoners until this inhospitable country had been left behind. They consequently accompanied the caravan until January 30th, when ten small tusks of ivory were accepted as their ransom, but liberally paid for, besides which each of the women and children received a present of beads and some food on their departure.

The Ascent of Mount Elgon.—On January 29th, Mr. Jackson left the Angalul with a view to obtaining a fresh supply of provisions in the district of Save, which lies to the north of Mount Elgon, and of proceeding across the very top of that ancient volcano on his return journey to Mumiya's. An ascent of about 2000 feet (from 4372 to 6346 feet) brought the explorers from the northern foot of the mountain to Save, the inhabitants of which dress like the Wa-kuavi. Their houses, however, are quite different, being round instead of oblong, and made of strong wickerwork plastered inside with mud, and having a nearly flat roof covered with earth. They cultivate wimbi, pumpkins, bananas, yams, and a small species of sweet potato. Honey is plentiful and the wealth in cattle, sheep, and goats appears to be considerable. But notwithstanding these great natural advantages of their present abode, the inhabitants talked of removing themselves elsewhere, as they were continually being harassed by Masai and Wa-Nandi. Even whilst the caravan was present in the district the latter invaded its western portion, carrying off some 200 head of cattle, besides killing a lot of people and burning their villages. Iron-wire are the only barter goods which are demanded by these people, and ivory they decline to part with altogether, excepting for cattle.

The country to the northward, as far as the eye can reach, is a barren waste with a small belt or two of trees marking the course of streams. The country around Lake Salisbury is, however, wooded. Three warlike tribes are reported as living around this lake, namely, the Kimama, the Kitaia, and the Elgumi.

The ascent from Save to the crater occupied four days (February 13th to 16th) and appears not to have presented any difficulty. Mr. Jackson, however, advises future caravans not to take this short cut, as the cold is intense. There was fortunately no rain, but two men nevertheless succumbed to it. The forest belt extends from 6000 to 9000 feet, and is succeeded by a bushy country, with heath and coarse grass. A curious tree with straight rough stem and a large leafy top grows abundantly between 11,000 and 13,000 feet.* The crater itself has a diameter of

* This is evidently the *Senecio Johnstoni*.—[E. G. R.]

about eight miles. Within it rise two rivers, the Angalul and the Sūm, which escape through the clefts. Much of the bottom of the crater is boggy and swampy; the rest is covered with grass, heath, mosses, or lichens. The highest point of the rim scaled by Mr. Jackson and Mr. Gedge attains a height of 14,044 feet, and apparently no other peak exceeds this to the extent of more than 50 feet.

The vegetation on the southern slope of the mountain was found to be much more luxuriant than that on the northern. The trees were taller, the forest was more dense, and the bamboos associated with it covered a larger area. It was within this forest belt that Mr. Jackson came across some of the cave dwellings discovered by Mr. J. Thomson. The first of these, at an elevation of about 7500 feet, was found deserted, its inhabitants having been driven away by the Wa-Nandi, inside it there stood about thirty huts, oblong in shape, like those of the Wa-kuavi. There was nothing about this cave, nor about any of the others visited subsequently, which suggested that they could possibly be the work of man. The first inhabited cave was met with just after emerging from the forest-belt, at an elevation of 6447 feet. Other caves of the same description were found in Kimangichi's district nearly the foot of the mountain. This chief with his people formerly lived in ordinary villages at the foot of the mountain, but was driven out of them by the Wa-Nandi, and had since then been afraid to leave his caves. The chief was friendly and intelligent. Food was plentiful in his district, wimbi, mtana, bananas, beans, and pumpkins being cultivated. Only iron-wire and cowries were taken in exchange; beads were hardly looked at.

On March 1st the caravan left the mountain, and, passing through an undulating wilderness covered with thick bush and long grass, entered the first village of Kitosh. The people exhibited fear on the approach of the caravan, and some of the porters, taking advantage of their timidity, entered the villages and stole fowls and other things. Being, however, discovered in the act, they were taken back to the camp and soundly flogged. At Kowala, however, through which the caravan had passed on the up-journey, the villagers had gained confidence, and the reception was a friendly one.

Back at Mumiya's.—On March 4th the caravan was back at Mumiya's. During Mr. Jackson's absence more of the cattle, goats, and sheep, had died, and there only remained thirty head of cattle and forty goats and sheep. The goods had been squandered in a most reckless and shameful manner, about 2000 strings of beads and several coils of brass wire having been expended, notwithstanding that an ample supply of food sufficient to last a month had been left with the men. Dr. Peters, who had passed through the place a month ago, and who had hoisted his flag at Kwa Sakwa, had been able to induce the Somali in charge to sell him three quarters of a load of beads, but Mr. Jackson suspects

that more of the missing goods were given by his Somali headmen to their countrymen with Dr. Peters, who had little or no goods with him when he passed.

Letters from the Rev. — Gordon and King Mwanga had arrived at Kwa Mumiya's during Mr. Jackson's absence. The king said that he accepted the Company's flag, and desired Mr. Jackson to go and see him. Dr. Mackinnon, a headman (Akedi), and sixty sick men were therefore left at the station, and the caravan started on March 11th for Uganda.

From Upper Kavirondo to Uganda.—The first day's march led through an open country, the villages along the road being all deserted. That night the camp was completely wrecked by a terrific squall of wind accompanied by one continuous roll of thunder and vivid lighting and a downpour of rain. On the following day the caravan crossed the Sio and took up its quarters with Tindi, a very civil and hospitable chief. Passing down the river through an undulating grassy country, with many villages about, the caravan reached the first of Tunga's villages. This chief is still a young man, splendidly made, but with a round bullet-shaped head and a truly villainous countenance, and looks what he is reported to be, a skulking coward and bully. Next morning, soon after the caravan had left his village, it was found that a teapot and some cooking pots had been stolen. As the chief refused to assist in the discovery of the thieves, six cows were taken as security, when the stolen property promptly made its appearance, the teapot having been found in the chief's own hut. The cows were then restored.

The country about here was better cultivated than any yet seen in Kavirondo, but all the crops of mtama and wimbi were suffering from want of rain. However another terrific thunderstorm was experienced at Buriari, another of Tunga's villages. After leaving Tunga's last village, governed by a younger brother of his, who proved friendly and hospitable, the caravan passed through a small stretch of uncultivated bush, which is looked upon as neutral ground, and entered Wakoli's country. This was on March 16th.

Busoga.—From the very border of this country to the capital (three days' march) the road led through vast groves of bananas. One of Wakoli's sons had met the caravan at the frontier and conducted it to the capital. Here presents of bananas, huge jars of "pombe," or banana cider, goats, &c., came pouring in from all sides. Small return presents were given as a matter of course. On the day after their arrival the leaders of the caravan were waited upon by Wakoli's "Katikiro" or Prime Minister, who remained until the chief came himself and conducted his visitors to a camp close to the village. Wakoli is a little man, about forty-five years of age, and very intelligent. He proved a great friend from the first, and as a matter of fact, during the whole period of the caravan's stay at this chief's village (March 19–25) it fared most sumptuously—fat bullocks, sheep and goats, fowls and eggs,

bananas, both fresh and green, pouring in from all sides. Everything in the shape of beads was accepted in return for these gifts, but ukota and mboro and coloured clothes was prized mostly.

On March 23, Mr. Jackson and Gedge made blood brotherhood with Wakoli, and Martin with the "Katikiro." The ceremony proved simple, and not objectionable. The two persons concerned sit down on a piece of cloth facing each other. A small incision is then made with a knife in the stomach of each, a coffee-berry is dipped in the blood, dropped into the palm of the right hand, and mutually exchanged. You then pick up this berry with your lips and swallow it, rub the blood on each other's stomach, and wind up with an affectionate embrace.

Wakoli asked repeatedly for assistance against a rebel chief named Kivendi, who was giving a great deal of trouble. This was granted, Mr. Gedge routing the enemy with ease. Kivendi, notwithstanding this defeat, and the subsequent burning of his principal village, refused to give in, preferring to retire to the bush.

Busoga, in Mr. Jackson's opinion, is far superior to Buganda in natural wealth, and Wakoli is anxious to enjoy the protection of the Company's flag. A station established at his capital was left in charge of a headman and thirty-two men.

One day's journey beyond Wakoli's capital the caravan was met by King Mwanga's Katikiro, who had orders to escort it to Mengo, the capital. On approaching the Nile, the country, although still fertile, was less densely peopled, and cultivation was consequently less extensive. In Ukassa, Chief Lubwa's country, there rise stony hills covered with short grass and bush, and separated by swampy hollows. The country is only thinly peopled.

On April 6th the caravan crossed the Nile at Jinja (Ripon Falls) and on the 14th it arrived at Mengo, the capital of King Mwanga. The whole of the intervening country had been laid waste in the course of the recent disturbances; but it is evidently a fine country, with a rich soil, capable of growing anything. All the banana groves and several small coffee plantations were choked up with long grass and in a dreadful state of neglect. Human remains and broken shields were scattered along the path, and everything bore signs of the recent troubles.

Mr. Jackson stayed at Mengo until the 14th of May, employing the time in building a house for Mr. Gedge, who was to remain behind with thirty-five men. The king proved very niggardly. "I don't suppose," says Mr. Jackson, "there ever was a man more unfitted to rule a country, as he takes absolutely no interest in the welfare of his people, but only thinks of his own safety and personal comfort." As a natural consequence all his people, even the Roman Catholics, cordially hate him, and he would long since have been got rid of, were it not the "custom of the country to have a prince on the throne," and that his only legitimate successor is a little child four years of age.

Mr. Jackson left Mengo on May 14th, and returned to the coast by way of Kwa Mumiya and Lake Baringo, that is, by the route followed, by Mr. Thomson.

Between Machako's and Mengo he spent 138 marching days on the road, viz.:—

	Marching Days.	Total Stat. Miles.	Daily Average Miles.
Machako's to Lake Naivasha (Aug. 6th-Sept. 11th, 1889)	16 ..	89 ..	5·5
Lake Naivasha to Sendege's (Sept. 14th-Oct. 22nd)	34 ..	135 ..	3·9
Sendege's to Kwa Mumiya (Oct. 23rd-Nov. 7th)	12 ..	45 ..	3·7
Excursion to Ngaboto (Dec. 10th, 1889-March 4th, 1890) ..	51 ..	308 ..	6·0
Kwa Mumiya to Mengo (March 11th-April 14th)	25 ..	150 ..	6·0
	138 ..	727 ..	5·2

These distances do not include minor windings. Altogether 252 days were spent upon the journey including halts.

After the paper,

Mr. RAVENSTEIN said that Mr. Jackson's expedition might not perhaps be entitled to stand in the foremost rank, when judged from a scientific point of view, but it had for all that done some excellent work. Several hundred miles of absolutely new country had been discovered, Mr. Gedge had prepared a very good map, and justice appeared to have been done to the fauna of the country visited. This fauna appeared to be of special interest, for on the Angalul not only species from South Africa and Abyssinia, but also from the Senegal had been met with. The new road to the Victoria Nyanza, now explored for the first time, did not apparently offer greater facilities for constructing a railway than did that first discovered by Mr. J. Thomson further north, and subsequently travelled over by Dr. Fischer. In one respect Mr. Jackson deserved special commendation. His firm but conciliatory attitude towards the natives, if it did not altogether prevent conflict, fortunately led to the ultimate establishment of friendly relations. There was no doubt that these natives had been provoked into hostilities owing to the conduct of caravans which had passed through their country before Mr. Jackson did so, for in Africa, it appeared the last comer had always to settle the bills of his predecessors. Fortunately, in the present case, the loss of human lives had been very small when compared with what was inflicted by at least one European explorer who had traversed the same region. Mr. Jackson, he thought, was deserving of thanks, and future travellers would reap the results of his conciliatory conduct, just as he himself had been able to profit from the kindly memories still alive among the Masai in connection with Mr. Joseph Thomson.

Mr. BOWDLER SHARPE (Zoological Department, Natural History Museum), said:—It is quite true, as the President has remarked, that Mr. Jackson has obtained on this expedition a very wonderful collection of birds, which I have had the privilege of examining; but everything which Mr. Ravenstein has said to-night about the wonderful increase to our knowledge with regard to Mount Elgon and the neighbouring regions, is borne out by the natural history collection which we have examined at the British Museum. Some twenty years ago I began the study of African zoology, and after some time I felt myself able, as I thought, to map out in some general way the different regions which I considered to be the natural areas of the African fauna, and I am sorry to say that I had, thanks to Mr. Jackson's former expeditions, my conclusions rather roughly shaken, but with this present expedition

I have had them entirely upset. I did not expect to find from the exploration of Mount Elgon that birds of that country would turn out to be not Abyssinian, not those of Shoa or East Africa or Kilima-njaro, but closely allied to those of the Cameroons. This means that we must entirely revise all our ideas as to the zoogeographical regions of Africa. I have found thirty new species of birds, and my daughter is describing now something like thirty species of butterflies; so that there is not the least doubt that this is one of the most important journeys in regard to natural history results ever undertaken by an Englishman in East Africa, and it does the greatest credit to the Company and Mr. Jackson, and reflects at the same time credit on the British nation. It is equal to anything done by those celebrated naturalists Emin Pasha or Dr. Fischer.

Sir THOMAS FOWELL BUXTON:—I have to make but a very few disconnected observations upon this paper, which I am sure is interesting in itself and has been put before us in a very interesting way. It is, perhaps, worth while just mentioning that this expedition was started before the last Anglo-German Agreement, and it was believed that the ultimate possession of Uganda might depend upon the party first in the field, whether English or German. However, finally it did not depend upon that but upon proceedings in Europe—a much more satisfactory settlement. The fact of that having been one of the reasons for sending and hurrying on the expedition, caused, of course, several difficulties in the way, and greatly increased the expense. I think I might observe, as having to do with the Company which sent out the expedition, that it was a costly luxury, and even though it affords great pleasure to the Company to present such a luxury to the Royal Geographical Society, I hope they will not expect a repetition too frequently; if that is the case our credit on the Stock Exchange might be somewhat affected. There is no doubt that the difficulties in the way of these travellers have been immensely increased by the proceedings of Count Teleki and Dr. Peters. Of course, it is hard to fathom anybody's motives, but inasmuch as Dr. Peters travelled deliberately through a territory at the time acknowledged to be within the British sphere, and apparently did all he could to excite hostility against any other white traveller, it opens the question whether such an inevitable result was accidental. There is no doubt that his proceedings and those of Count Teleki have raised great difficulties and dangers for any other travellers, and I entirely agree with Mr. Ravenstein in all he said upon that point. I would draw your attention to what Mr. Ravenstein said as to the great disease that besets all these populations, that is that every village is more or less at war with its neighbours; they are constantly in the habit of making raids and carrying off the weaker members of the tribes. That being the case we cannot but believe that any interference whatever from the outside which helps to keep the peace, either by a certain degree of force or by introducing habits of communication leading to the habit of buying and selling, so far as it tends to bring about peace, does a great deal towards removing that from which Africa suffers so much; and I am quite sure the desire to introduce peace where there has been war and put an end to slave-trading expeditions, is a motive which has gone a very long way in actuating the men who started the Company. They have undertaken to make a great experiment and may not obtain much influence for a long time, but we owe a great deal to those like Mr. Gedge and others who have served us so loyally. We are glad to know that he has brought home birds of such value, but those who had charge of the expedition will feel that the objects of the expedition are the first consideration, and the collection of birds will always occupy a secondary place.

Ven. Archdeacon FARLER:—I really was not prepared to say anything to-night. There is only one word that I rather object to, and that is the idea of the Company

settling in Usoga rather than in Uganda. I have always found that the Arabs have a very keen insight as to which part of a country is its centre of life, and they have never taken any notice of Usoga but always striven to establish themselves in Uganda. It has been my privilege to see a great deal of the people of Uganda, and I consider them the most intelligent of any people I have found in Africa, and I sincerely hope and trust that the East Africa Company, so soon as it can do so, will make its settlement in Uganda. Mwanga might easily be removed, and the young gentleman of four years of age of whom we have heard be substituted for him. Mwanga is a thoroughly bad king, and has been a pawn between the English and French missions. I have felt from the first that it was a mistake for these two missions to work in the same district, and that as the Church Missionary Society was the senior it should remain. Mr. Ravenstein speaks of the Arabs adopting the northern route; they never go that route so far as I know. They always go viâ Kilima-njaro, through a country where there are not the natural difficulties of the northern route; it would be a good route for a railway, but as it goes through German territory I suppose it is impossible. I sincerely trust as soon as possible the British East Africa Company will make itself felt as a power in Uganda, and prevent the Arabs returning again. They are but waiting on the border, and if once they enter and get possession it will prevent civilisation for many years to come.

The PRESIDENT:—It is to be regretted, ladies and gentlemen, that neither Mr. Jackson nor Mr. Gedge was here to address us, but Mr. Ravenstein, as usual, put the information which they have supplied into a very clear shape, and has addressed us in a manner which your frequent applause showed was very acceptable to you. We have also, in the short speeches which have followed, received some additional information. I refer more especially to what we were told by Mr. Bowdler Sharpe, from which it is quite evident that in addition to its other functions this expedition has added very seriously to our knowledge of the natural history of that part of Africa and has supplied data which are of general importance in the study of the fauna of Africa. I am convinced that you will wish me to give your thanks to Mr. Jackson and Mr. Gedge for what they have done and for the information they have supplied to us, and I know that you will desire to include the reader of the paper, Mr. Ravenstein, in your acknowledgments. I think we may trust to Sir Thomas Fowell Buxton, who takes an active and important part in the affairs of the Company under which Mr. Jackson and Mr. Gedge are working, to let them know that all they have sent home has been received here with the greatest possible interest.

*Expedition of the Brothers Grijimailo to the Tian Shan Oases
and Lob-nor.*

Translated,* with Notes and Introductory Remarks,
by E. DELMAR MORGAN, F.R.G.S.

Map, p. 248.

M. GRUM-GRIJIMAILO, accompanied by his brother, explored last autumn a very interesting and little known part of the Russo-Chinese borderlands, including the mountainous region to the east and north-east of the Ili basin, forming a continuation of the Boro-horo chain,† in

* From the 'Izvestija,' tom. xxvi. vyp. iv. pp. 272-299.

† On maps generally, Iren-Khabirgan.

which I travelled in 1880. He claims to have discovered, as already announced in our 'Proceedings,'* a knot or group of mountains hitherto unvisited and even unseen by any modern traveller. This group, bearing the native name of Doss-megen-ora, i.e. "loftiest of mountains," was not mentioned by Prejevalsky, Regel, Larionof, and other travellers whose routes lay to the southward, neither do I remember to have heard the name from my Kalmuk guides, who gave me those of the peaks visible from the valley of the Kash. Doss-megen-ora is not marked on any Russian map that I have seen, though Bogdo-ola, farther eastward, is a prominent feature in the cartography of the Tian Shan. The fact of its remaining so long unknown is attributed by M. Grijimailo to the high outlying mountains which mask it on the south and west; on the north it is too remote from Peh-lu, or the great northern Peking route, to admit of its being viewed from that direction, while to the east a mountainous tract continuing the main axis of the Tian Shan bars approach from that side; lastly, the inhabitants are shy and reluctant to give information that may lead to the discovery of their lofty and secure retreats. M. Grijimailo could do no more than give a general idea of the topography of this elevated region, for he was anxious to hurry on to the Bogdo-ola. On his way thither he crossed several rivers flowing down the northward slopes of Doss-megen-ora, and describes them as of unusual interest. One in particular, the Khusta, flows in a cañon of great depth and length, with a current so rapid that no soundings were possible. Reading his description of it we are reminded of those marvellous cañons in Colorado where rivers are buried at much greater depths below the surface, though we need not look so far for a parallel. I call to mind the Lepsa, a river that, after watering the town or stanitsa of the same name, cuts its channel almost at right angles through a chain of mountains by a narrow and impassable gorge on its way to join Lake Balkash.

These mountain ranges of Central Asia, running east and west, are in their general features very similar. Great altitude, a rampart-like abruptness of the main axis, and a poor monotonous flora, consisting of spruce fir on the northern slopes of the higher belts, meadow lands descending several thousand feet lower, followed by pebble-strewn plains, and, where there is water and sedentary inhabitants, by a fringe of cultivated oases. Beyond these are the sandy-clayey steppes with their characteristic vegetation.

Bogdo-ola, "the lordly mountain," the next point of interest visited by the Brothers Grijimailo, is more familiar ground—at all events the name is not new, appearing as it does on all maps of Central Asia in lat. 43° 30' approx., and in long. 89° east of Greenwich. The word "Bogdo" signifies in Mongol "lordly," "majestic," and occurs in Bogdo-

* Cf. 'Proceedings,' August 1889, vol. xi. p. 505; October and November 1890, vol. xii. pp. 616 and 668.

Khan, i. e., supreme khan or monarch, Bogdo-lama, the grand lama. It has also the sense of "holy" or "sacred," and reminds us of the Slavonic *Bôgh*, "God." It was the sacred mountain of the Mongols, just as Tengri-tagh was that of the Kirghiz, *Tengri** in their language also meaning "God." A Chinese author quoted by Ritter† says that no Hiong-nu (Hun) or other of the Turkish people dared to cross Bogdo-ola without having dismounted and offered up a prayer. An odour of sanctity still pervades it, for M. Grijimailo found strict orders posted up near the lake at its foot, warning all persons under the severest penalty not to kill the deer and other animals, or allow their cattle to graze on its slopes—orders, it is almost needless to say, disregarded even by the attendants of the numerous temples erected here.

To the south of Bogdo-ola and the ice-capped nameless range continuing to the eastward, lay the ancient kingdom of the Uighurs, mentioned frequently in Chinese annals under the name of Hoi-Hoi, or Turks; and it is interesting to learn from M. Grijimailo that there are many remains of their cities. He speaks of the gold and silver objects dug up in the region round Pichan, Lukchin, and Turfan, of copper vessels and inscriptions (in Uighur characters?) on leaves preserved in wooden boxes. All this is of the highest historic interest, for it brings us nearer to the origin of a race once dominant over a vast portion of the old world. The descendants of those Uighurs, a people known by the name of Chen-tu, allied to the Sarts of Western Turkestan, now occupy that region, where they display extraordinary energy and skill in irrigation works. M. Grijimailo passed more than a month among them, studying their songs and collecting ethnological materials, which will doubtless be published hereafter, together with the detailed notices on the animal and plant life of these regions.

He also visited a volcanic district, or, as he terms it, a burning coal-field in the mountains south of Shi-ho. This calls for a few remarks. It is generally believed by M. Mushkétov and some leading Russian scientists that the theories advanced by Humboldt,‡ Ritter, and others regarding the volcanicity of this part of the Tian Shan were erroneous. Relying chiefly on the Chinese books and the reports of the few travellers that had made their way into these parts about the beginning of the present century, those great masters of geography fixed upon this central point of Asia as the seat of volcanic activity, associating it with Mount Peh-shan, or the White Mountain, north of Kucha, about 3° east of the Issyk-kul lake, and Mount Ho-shan, near Turfan, 180 leagues further to the east. We now find in the phenomena described by M. Grijimailo some confirmation of these theories. He observed smoke issuing

* Tengri-tagh, "Mountain of Heaven," was the Turko-Tartar name of Bogdo-ola. Cf. Humboldt, 'Asie Centrale,' tome ii. p. 36.

† Cf. 'Erdkunde,' 2ter Theil, 2tes Buch, Asien, Bd. i. p. 337.

‡ Cf. Humboldt's 'Kosmos,' translated by Sabine, vol. i. p. 232.

from fissures in the ground, the lips of these fissures encrusted with crystals of sulphur; a white substance, probably silex, covering the surface: funnel-shaped cavities emitting jets of steam, suggesting comparison with recently active volcanoes in Iceland; the ground heated so that walking over it became difficult if not dangerous; mud having the appearance of being baked and a general fiery appearance when seen from a distance; naphtha springs and deposits of sal-ammoniac. All this, taking also into consideration the recent alarming and disastrous earthquakes in the Issik-kul district,* call for further investigation. It is true no lava is mentioned, but the great eruptions spoken of by a Chinese author refer back to the 7th century of our era, and the lava might in course of time have been covered by other deposits.

M. Grijimailo's narrative runs as follows:—

We are now at Hami, and it is time we informed you of the chief results of our expedition. Our route may be briefly summarised as follows:—Jarkent, Kuldja, Achal pass, Jin-ho, southwards into the mountains and along the Tian-Shan range, keeping at an altitude of 6000 to 10,000 feet as far as the river Ulan-ho, up this river and back, across the highlands to Khotubii and thence by high road to Urumtsi. From this last-named place we went into the Bogdo-ola mountains; having descended them we again followed the high road to Jimisar and thence northwards. From fort Khobu-zeh a side road led us to Guchen where we struck across the sands into Central Dzungaria. Returning to Guchen we followed the high road to Muli-ho (Morokho) and then crossed the mountains to Jan-bulak. Here we divided our party and penetrated by two passes, Builuk and Ulan-ussu, into the Turfan district, from Lukchin we took the road to Dza, the mountains of Chol-tan and Tinge-tan southward nearly as far as Lob; then via Chiktym by the southern road to Hami. Our itinerary covered 2080 miles altogether. Of these 1700 were mapped and 1417 had not been travelled before; nineteen positions were astronomically fixed; fifty-one heights hypsometrically and one trigonometrically determined.

The features of the country may be described as follows:—If you will look at a map of the Central Tian Shan you will see that exactly at the head waters of the Kash three ranges converge; these are—the Urumtai chain, the range separating Dzungaria from the Ili basin, and a third stretching in a south-westerly direction to Khan Tengri. Here a mountain knot might have been expected, and such we actually discovered, bearing the name of *Doss-megen-ora* meaning “loftiest of mountains.” From the valley of the Kash and the great and lesser Yuldus this upheaval is masked by high spurs, a fact which accounts for this huge mass of snows and glaciers remaining so long unknown. We saw it from the passes on the northern side of the Tian Shan, and fixed its position by triangulation. Our attempt to make our way to the foot of these grand peaks was unsuccessful, owing to the flooded state of the rivers and the absolute impassability of the road. Having in five days only advanced 10 miles up the Ulan-ussu torrent we turned back, not without losing several horses in vain endeavours to find fords and roads round the cataracts. In *Doss-megen-ora* the rivers Khorgos, Ulan-ussu, and the copious Khusta have their sources, besides the subsidiary streams Khumuk-sala and Shlncha-ho. The lower Khusta

* For an account of these earthquakes, see ‘Proceedings R.G.S.’ October 1888, vol. x. p. 638.

takes the name of Manas and divides into seven channels hardly fordable in summer. Where we crossed this river it is confined in a cañon 10 to 14 feet wide. We crossed it by a narrow little bridge only a yard wide and supported on four *karagatch** poles. Here we lost a horse and its load, as it broke loose and fell into the river a height of 280 feet. We led the horses over, having unloaded them, and carried their packs by hand. The chasm of the Khusta is composed of very compact grey limestones worn by the water into the most fantastic shapes. This chasm is 26 miles long. As the river flows out of it and enters the valley it widens and divides, as I have said, into seven channels which serve to irrigate the oasis of Manas. Besides the rivers already mentioned flowing to the north, the Yuldus and Kash also rise in Doss-megen-ora, the former flowing to the south-east and the latter to the west.

The Boro-horo range, dividing the waters of Dzungaria from those of the Ili basin, is a lofty continuous wall-like chain with very short abrupt northern slopes and outliers and no valleys. This absence of outlying hills does not allow the snow water to collect and form great rivers. Such streams as there are flow in narrow defiles, becoming mere chasms higher up, where even a pedestrian would find it difficult to make his way; lower down they form cañons, walled in by alluvial conglomerate. The depth of these river beds is very great, in the case of some (for instance the Kijtyk) exceeding 1000 feet. There are no terraces, and the rivers are usually hidden from sight till one comes close to them. The largest of these rivers is the Kijtyk, and the following may also be mentioned; Borostai, Jin, Ebtch, Jirgalty, Itkhan-Anchkha with its affluents the Ulasta and Pitchkan-Anchkha, and the Altyn-gol. Where the Boro-horo separates from Doss-megen-ora its height is very great; large masses of snow lie on its summits and patches of it on the principal spurs. The only pass is that of Ulan-ussu, and even this is impracticable in summer—at all events we heard of no other. Unfortunately there was nobody to give us reliable information, for we had no guide. Concealed by mountains in the foreground, we could not obtain a good view of the Jirgalty-Ulan-ussu section, so that it was difficult to say if there were a more or less gradual fall towards the west, though this is hardly doubtful, judging from the fact that the Myngaty, Achal, and Talki† passes lie below the snow line. The exceedingly steep axis of the Boro-horo is seamed by defiles and is nearly devoid of vegetation.

It is remarkable that there should be no talus in these mountains, though gravel and huge masses of fallen rock frequently occur in the beds of defiles by which the snow water drains away in dribblets. So steep are the sides of these mountains that vegetation finds no foothold; on the other hand, the outlying hills and more gradual slopes, serving to buttress the overhanging cliffs, are fairly well clothed with grass, and the spruce fir, characteristic of these uplands, covers with continuous impenetrable forests the more accessible parts from foot to summit, here and there giving place to meadows. Steppe vegetation is rare, and even Alpine meadows are the exception. These latter are only met with in westerly parts of the range; to the east of Jirgalty they are confined to small ledges and a few of the defiles. Wormwood only grows on slopes facing the south. The real steppe feathery grasses are prevalent everywhere below 6000 feet, and only disappear with the last hills, where they give place to gravelly plains with their very characteristic vegetation. This stony steppe encompasses with a wide belt the Boro-horo mountains, separating them from the cultivated land which extends along the northern road, the so-called Peh-lu. Bushes

* Black elm, a common tree in these parts.—M.

† The Talki is the well-known pass over the Boro-horo, north-west of Kuldja; it leads directly to Lake Sairam-nor, and has a height of 7000 feet above sea-level.—M.

and wide-leaved trees only find shelter in the defiles, where they mingle with the spruce. There are few apple-trees, but an abundance of raspberry (*Rubus idaeus*), never found in the central and western Tian Shan. Generally speaking, the precipitous walls of the main axis of the Boro-horo, its wild, inaccessible defiles, its great outlying hills and abundant humidity, all tend to produce sameness in the flora; one mountain is like another, the gorges are identical in character and vegetation. This sameness in the flora and conditions of existence affects also the insect world. The investigation of the lepidopterous fauna confirmed in a remarkable degree the opinion expressed in my 'Le Pamir et sa faune lépidoptérologique'—that the fauna of this group of animals in the Tian Shan is not an independent one. Since the lepidoptera of any district are closely dependent on its flora, it must follow *à priori* that the two are related to one another, though M. Krasnof denies it. As I am no botanist, however, I will not break a lance with him on the subject. The mammalian and avifauna of this region are generally well known. Moreover, our collections of both one and the other were very small—the animals were shedding their fur, the birds were moulting. We obtained, however, about twenty good specimens of *Lagomys*, and an equal number of marmots—*Arctomys baibacinus*, besides one *Cervus maral*. On descending to the gravelly steppes, though we shot *Antilope subgutturosa* and wild ass, their skins were unfit for preserving. And now let me finish my description of the Boro-horo.

The northern slopes of the Doss-megen-ora intumescence, between the rivers Khorgos and Khusta, form an exceedingly wild, almost inaccessible mountainous country, extending far to the north. The Khusta, the largest of the rivers of the northern slope of the eastern Tian Shan, takes its rise in the southern slope of this group and flows, at first, in a wide defile along which lies the track, used even in winter, from the Ulan-ussu pass to that of Keldyn; then turning to the north the river suddenly narrows and bursts into a cañon, formed of compact grey limestone. In this cañon it rushes with amazing rapidity for upwards of 30 miles, then flows in a bed of conglomerate for 20 miles farther, and finally debouches in the valley of Manas, where it divides into seven channels. It would be impossible to say, even approximately, what is the depth of this river in its central course, for the force of its current is so great that a stone weighing 20 lbs. thrown into the river from a height of 50 feet ricocheted several times before it sank below the surface. According to the Torgute natives here, between the Ulan-ussu and Khusta, at the very foot of the many-peaked Doss-megen-ora, there is a plateau or syrt which on the north merges in the above-mentioned mountainous country. This table-land is called Doss-megen, and is held sacred by the Torgutes or Turguts.* There must doubtless be a good road thither, but they refused to show it to us. The fauna and flora of this region offer but few points of dissimilarity from that of the Boro-horo, of which it forms the immediate continuation. The same remark may also probably hold good with reference to the Urumtsi range, though this last was explored least of all by us. If you will turn to the map you will see that our route plotted on it takes a more and more north-easterly direction after leaving the Khusta. This was occasioned by a variety of circumstances of which I will mention the following: want of guides, inaccessibility of the country, and the probable loss of precious time had we set ourselves to find the road. We made haste to reach the Bogdo mountains in order not to let slip the opportunity of securing the remaining lepidoptera which I considered indispensable for my collection. The direction we took brought us by degrees to Peh-lu, and we followed this from Khotubii (not Khotukbai) to Urumtsi. Then we

* A branch of the Eleuth-Mongols inhabiting in greatly reduced numbers the region about Yuldus and the upper valleys of the Ili tributaries.—M.

had to study the Urumtsi ramification of the massive Doss-megen-ora. I will not say that our investigation of it was by any means complete; we could not even decide whether it were a single or a double range; all that we could say for certain was that the height is enormous, and that its outlying hills make up a wild mountainous region, inaccessible even for pack-animals for a considerable distance.

Of the rivers flowing from this range the following may be named:—Santa-ho, Khotu-bii, Lok-ulan, Katun-ho, and Urumtsi. The first of these is bordered throughout its entire course by noble, wide-leaved trees, such as we found nowhere else; the other valleys we crossed within the limits of the cultivated zone, and therefore could say nothing of their floras. Judging, however, from the fact that between this belt of cultivated land and the nearest hills, there is a monotonous expanse of clay steppe, bearing rare bushes of *Rubia* (?) and *Echinosperrnum*, and that the hills in the foreground have a reddish-grey tint, it may be inferred that the valleys are more of the nature of pebble-strewn ravines, bearing rare clumps of reeds or *Lasiagrostis*. The whole landscape, however, is not devoid of a beauty of its own, and with our binoculars we could see herds of antelope and wild ass grazing on the plain, though, owing to their shyness, it was a difficult matter to get within range.

Urumtsi, the residence of the Governor-General, Fan-teh, is a town rising from ruins. The district is poor, and besides corn and poppy more recently introduced, produces nothing. Every kind of food is imported, from rice to grapes and other fruit; apples alone ripen here. The people of Urumtsi have not even cattle of their own, notwithstanding the abundance of pasturage; it is all driven hither by the Kirghiz-Kirehs and naturalised Russian merchants from Chuguchak and Altai. This anomaly is attributable to the fact that the Urumtsi district is sparsely populated, and has no nomadising inhabitants. Kalmuks are not allowed to trade, and the Kirghiz-Kirehs are only suffered to pasture their cattle on its way to market. Our Russian subjects are under like disabilities.

I now proceed to the most interesting part of our itinerary, and, in accordance with the order I have sketched out, will begin by generalising, and fill in details afterwards. It is usual in maps to extend the Tian Shan as far as 95° of long. E. of Greenwich; M. Pevtsof takes it even further. But this is hardly accurate, and for the following reason:—Bogdo-ola is visible from Manas; plainer from Chiteh, Guchen, and Gashun. From every point of view it takes the form of a huge trapezium, with one of its sides protracted as a long range glistening with perpetual snow and ice. Lofty as the Tian Shan is, it appears insignificant as compared with the gigantic Bogdo-ola (Topatar Adlieh), which presents from every side a magnificent sight. This enormous uplifted mass falls with unusual abruptness towards the Urumtsi valley, and only on the east is prolonged as a massive snow-capped nameless range, extending without a break to long. $90^{\circ} 50'$ E. of Greenwich. Here it suddenly subsides, merging in a table land studded with isolated cones, scattered in great confusion. This table land, extending in an easterly direction, has a steep fall on the north and south, where it becomes a succession of wild barren defiles. Having crossed the range at this place, the traveller has on the west a row of sublime peaks with the loftiest wall-like cliffs, crowned by a gigantic hog's back, and on the east an expanse studded here and there with an isolated sugar-loaf mountain; the cart track ascends imperceptibly from the north, while on the south the descent is even more gradual, so that it is impossible to say where the pass is. It would seem therefore that we had before us a sudden termination of the snowy range. But it will be for the geologist to decide from the specimens of rocks collected by us whether this really be the case. Farther east the aspect of the mountain ranges may be described as follows:—The above-mentioned plateau extends for ten miles;

it is then succeeded by undulating land with conical hills continuing for 40 miles farther. There it abuts on a range having a north-westerly direction. A second range less lofty than the first-mentioned unites with it at an acute angle so as to close the undulating plateau on the south. Across it lies the cart track connecting Turfan and Hami. The former range bears the name of the Barkul Mountains, and unites with those of Hami a little to the east of this last town. At their point of junction several snowy peaks are visible, though we were unable to distinguish them, for it was winter, and all the mountains and passes are at this season covered with snow. The Hami range has also a north-westerly direction, and under the name of Mechin-ora closes the Barkul depression on the north; while on the south-east, according to native information, it continues as far as Su-chau. Along these Hami Mountains lies the direct caravan road to the province of Kan-su and China proper, and we shall avail ourselves of it for our journey from Hami to the Nan-Shan.

I consider that I have now established a *prima facie* right to distinguish the Hami Mountains from the Tian-Shan and include them in the Altai system. In support of this the following facts may be adduced:—The Hami Mountains are by no means the last fold of the Altai system. It was hitherto supposed that the whole Tarim-Hami wilderness was a moderately raised plain, but this is entirely erroneous. It is a mountainous country throughout, the ranges having a general north-west and south-east direction, and by no means so low as those of Dzungaria for instance, where the mountains, having also a north-westerly direction, are apparently disconnected. Some of the Hami ranges on the contrary are of great length, upwards of 200 miles, and from 6000 to 10,000 feet high, besides being inaccessible. If the reports of native hunters may be credited, the area covered by this mountainous region covers more than 10,000 square versts, or nearly half the extent of the Pamir, though certainly only about half its absolute elevation. I shall have another opportunity of speaking more at large of this newly discovered mountainous country, and will now only call attention to one circumstance, viz. that all its ranges have the same general direction as the Great Altai, the Dzungarian Mountains and the Hami range, the last mentioned having a length of not less than 330 to 400 miles. Of the truth of these data I shall, however, soon be able to speak more positively, as we propose travelling along this supposed range to Su-chau.

Though I did not obtain specimens of the rocks composing the Hami range, I did collect some 25 pebbles, and these convince me of the fact that this chain forms a link in the system of folds which furrow Eastern Dzungaria and the Tarim-Hami region. As I am not a trained geologist, I might doubtless be led into error if I were to attempt to determine the age of the strata composing the Altai and Tian-Shan ranges, I will therefore be cautious and confine myself to the following remark: the mountain masses having a north-westerly direction are mostly composed of crystalline rocks (granites, felspars, quartzites) jaspers and marbles; all the other formations may perhaps also be palæozoic and azoic. It is worthy of mention that many of the valleys are strewn with opals, cornelians, crystals of rock crystal and bits of crystal of a bright green colour. In Dzungaria, only the Maile-tau has, besides opals and jaspers, flints, whence it derives its name of the "fat-covered mountains."* In the Tian Shan we find a very different order of things. Here the left part of the range consists of a greenish-grey calcareous sandstone, underlying limestones, sandstones,

* The streams of liquid fat mentioned in the history of the Tang dynasty are referred by Humboldt and Ritter to lava streams, supposed to have flowed from Ho-shan, the fire mountain near Turfan. Cf. 'Asien,' l. c. p. 336; cf. also Humboldt, 'Asie Centrale,' tome ii. p. 32.—M.

coloured clays (clayey schists also occur in the Altai Mountains, but they partake here of a delicate bluish colour, yellow and red conglomerates are likewise not uncommon). Granite I only met with once, and then in the form of river boulders; and I saw no outcrops of it in the Bogdo-ola nameless range. This in itself confirms rather than controverts the above mentioned supposition. We will however leave this question to be settled in St. Petersburg, where doubtless M. Mushkétov will express a categorical opinion.

Next I have to make another small remark. M. Krasnof in his geo-botanical review of the Tian Shan declares there are no larches in that range, though in this instance he overlooked the mention of this tree in Potanin's materials; he is nevertheless entirely right if we distinguish the Hami range from the Tian Shan. I personally convinced myself that the larch does not extend from the Barkul-Hami Mountains to those of the Tian Shan; it is therefore quite admissible that there may be some difference between the floras of these two ranges. Unfortunately I am no botanist, my collections can, therefore, be only incidentally interesting, and I must rest satisfied with the thought that a specialist will soon find his way hither, who will decide this interesting question.

Bogdo-ola may be ascended by a fair road from Urumtsi. This mountain is reckoned to be God's throne; from its heights the Divine Being is supposed to descend occasionally to the lake at its foot. The whole locality has a reputation of sanctity, and from this cause numerous temples have been erected there. A notice has been put up near the lake of the following tenor:—"It is forbidden, under penalty of instant death, to violate the tranquillity of this holy land. There must be not only no shooting and no tree-cutting, but cattle may not even be pastured here, that they may not trample under foot the herbage belonging to God's creatures." The attendants at the temples, however, fell timber without any prickings of conscience, Fan-teh pastures his fifty mules here, and the Kirghiz-Kireh surreptitiously destroy the sacred deer. We were equally profane, and having turned our cattle out to graze by the shore of the magnificent alpine lake, proceeded to explore this marvellous group of mountains. I regret to say that the materials collected are not yet ready for publication, and therefore final results must be deferred for a while. Local circumstances prevented my brother from determining trigonometrically the height of the highest peak—the so-called Topatar-Aulieh, but one of the western summits was measured; we succeeded in making the ascent of the chief spur of the group, and ascertained by boiling-water apparatus the height of the snow-line. We also obtained a satisfactory photograph.

Like the Boro-horo Mountains, Bogdo-ola is clothed from foot to summit with spruce firs and meadows. The alpine meadows only form a narrow belt immediately below the snow-line; there is almost a complete absence of the floras of the steppe and pebble-strewn plains. The bushes do not form coppices, but are scattered here and there in the midst and on the borders of the spruce forest, on the shores of lakes, and by the side of brooks. The apple, the apricot, and the barberry, are conspicuous by their absence; at all events, I did not come across any: on the other hand, juniper and woodbine, and on the lower ground blackthorn (*Cratægus*) are plentiful. Hardly any camel-thorn can be seen, and the large-leaved trees are confined to the river valleys; here, too, there is a greater variety of bushes, and the *karagatch* (black elm) is the commonest of trees, though poplars also occur. Besides these, I for the first time met with the aspen (*Populus tremula*), a tree common enough in the mountains about Issik-kul, but never met with in the Boro-horo and Urumtsi ranges.

Animal life is poorer here than might have been expected. Besides the maral (great deer) distributed throughout the Tian Shan, we only met with wolves and

Cervus capreola; there are but few representatives of the bird world; besides the common kite (*Milvus melanotis*), crows and sparrows, we met with three kinds of crow, two thrushes, a three-toed woodpecker, a species of accentor, a Budytes, a Motacilla, a nuthatch, a green grosbeak, goldfinches, *Megaloperdix thibetana*, and several of the swimming and wading families, altogether twenty-five kinds; however, we did not collect birds very energetically, as they were not in plumage, and their skins were unfit for preserving.

The following rivulets descend Bogdo-ola;—Shim-gu, Khaidajan, Dnkhunjan, Yrdo-khoza, Lotai, Sotsa-ho, Dalan-gu, Morokho, and Baian-ho, besides several brooks; these rivulets, however, in summer are deficient in water. If we consider that there are only five or six small streams flowing to the south, it is difficult to explain what becomes of all the water produced by the melting of the enormous snow-fields of Bogdo and Nameless range as far as the meridian 90° 50' (E. of Greenwich) of the Ulan-ussu Pass. Fortunately I am able to answer this question in a completely satisfactory way. The Turfan district between Chiktym and Toksun is comparatively very thickly inhabited, as we learn from a census taken three years ago that there were 11,340 families, or about 65,000 inhabitants. Assuming the whole area of this district at 7500 square versts, and deducting three-fourths of this area occupied by gravel and drift sands, we have 1875 square versts as the habitable portion, with a population of 65,000, who obtain their supply of water for irrigating their fields partly from springs, partly from underground water conduits (karys), in other words they are supplied by subterranean artificial water. The quantity required is enormous, and according to experienced persons, may still be increased by the construction of new channels. The source of this subterranean water can only be the Lukchin hollow and Khandui hollow, in which it accumulates from the Nameless range. It is remarkable that even mountain torrents disappear in the rocks as soon as they leave the hills, and some, let it be observed, are of good size; thus the Kok-yar and Utyu-auza may compare with any of the northern streams.

What has been said with reference to the Turfan district may also apply to the cultivated land round Beplu. Here springs are more numerous than running streams, but if we take into consideration the boundless steppes, overgrown with reeds so high in places as to conceal a horse, it may be easily understood what an enormous quantity of subsoil moisture is contained in these areas. The oasis of Guchen is fed by springs, the whole tract from Dulan-gu to the Chiteh Valley is devoid of any torrent; the oasis of Khobuzeh to the north of Jimisar is chiefly supplied by spring water, and such springs occur everywhere to the east of Morokho and between Fukan and Irdo-khoza. The belt of springs extends not only along the Peh-lu but for a considerable distance beyond, even to the other side of the Nelsin sands, bounding these latter on the north with a narrow fringe of saline marshes, where it is only necessary to dig to find water in any place. I have myself tried this at three several spots: Gashun, Sy-djir and Chigi-chindza, but it is not at all improbable that the next traveller may find more.

Springs enable the numerous animals inhabiting Dzungaria to exist; of these the most interesting is Prejevalsky's horse (*Equus przewalskii*). The only known specimen of this animal, in the Zoological Museum of the Imperial Academy, was obtained by Prejevalsky from the chief magistrate of the district of Zaisan, who had received it from the Kirghiz. Prejevalsky himself, though he crossed the desert of Dzungaria in three several directions, never came across any of these wild horses, and if he wrote otherwise he was mistaking kulans he had seen in the distance for wild horses, a mistake the most experienced hunters are liable to make, for at that distance it is almost impossible to distinguish between them. It is only by

their manner of holding themselves that these animals may be recognised. The stallion of the wild horse never leads the herd but is always behind, taking care of the young, which he protects better than do the mares. But however this may be, we were the first Europeans who, for twenty days, made a study of these interesting animals, adding the skins of three handsome stallions and one mare to our collection, an acquisition we may well be proud of, though made at the cost of many hardships and privations. Besides *Equus Przewalskii*, Dzungaria has the tiger, two antelopes (*A. saiga* and *A. gutturosa*), two wild asses (*Equus hemionus* and *E. onager*) and among small animals: hare, *Erinaceus auritus*, and a few rodents not yet determined. The common wolf and steppe-fox are plentiful in all parts. With regard to the wild camel, its existence here is not confirmed, though it may possibly be found near lake Ehbi-nor or Ayar. Dzungaria has a richer avi-fauna than might have been expected; unfortunately we were obliged to give up the birds for the sake of the horses, for any unnecessary shot fired might have occasioned the loss of several days devoted to the pursuit of a herd of these animals, in quest of which we had gone to Dzungaria. We succeeded, however, in obtaining fifteen kinds of birds, among which I will mention the land-rail, two species of shrikes, the redstart (*Motacilla phænicurus*), a kind of sparrow with a shrill note, and the very common sand grouse (*Syrrhaptes paradoxus*), several sandpipers, marsh-hens, mallard and teal, and to my surprise the common grey goose, resting in the saline marshes of Gashun near our headquarters. We also found a good number of insects, though it was September, so that we have no reason to complain of the results of this expedition. On the other hand we sacrificed several horses, which fell victims to hard work and brackish water, and had to be abandoned to their fate.

To the east of Ulan-ussu the spruce-fir entirely disappears and the only arborescent vegetation we observed was the cotoneaster, growing here to the size of a small tree; among bushes we found briar-rose, spiræa, caragana, lonicera, juniper, and stunted saxaul; and among half bushes *Eurotia Ceratoides* and *Peganum harmala*. Marsh meadow land occurs in the neighbourhood of springs and rivulets, where an occasional willow appears as a narrow-leaved bush. The prevailing floras are those of the gravelly steppes and saline clayey ground; here the first vegetation to catch the eye consists of saxaul, caragana, climbing ephedra, *Peganum harmala*, and a few of the *Gramineæ*; on the salt marshes, reeds and saline plants or feather grass; these two, together with *Festuca*, may sometimes be found on the gravelly plain. The steppe generally overpowers the meadowland, for this latter is only met with high up in the defiles, where we obtained, notwithstanding the lateness of the season, *Primula*, a species of mint and an onion, with some other plants of like kind. The abundance of springs and magnificent pasture land have attracted hither numbers of animals. In the higher mountains herds of ten to fifteen arkari, or wild sheep, may be seen grazing, constantly preyed upon by grey and red wolves (*Canis alpinus*); these last-named animals we saw twice, but did not succeed in killing one. On the lower ground the saiga antelope and kulan or wild ass (*Hemionus* or a new species) are very common. The goat, fox, and bear, which select the wildest crags and the highest ridges for their abode, are more rare. The fox of this country is of a dark red colour, but there are also blackish brown ones, though these are rare. In autumn there are but few birds; among those added to our collection were a species of *Accentor*, a thrush, a linnet, finches, and among the larger birds a bearded vulture, which was shot by the carcass of a wild ass. There were a few insects, although it was September; but it was evident that the time for them had passed and that we might close the boxes set apart for them. It is remarkable that we should not have observed the autumnal migration of birds, only cranes passed over in large numbers and small flights of grey geese, duck, teal, mallard, &c. Winter was approaching

with rapid strides on Peh-lu; in September snow had begun to fall and storms to blow, and it was time to think about crossing the Tian Shan.

We crossed this range by two passes. I went in light marching order over the lofty Builuk, my brother with the baggage across the often mentioned Ulan-ussu. I met him at Lemchin, having first gone to Turfan, and then, *via* Lukchin to Pichan, whence I returned to Lemchin. It will be seen by the map of my route that our further explorations were concentrated on the southern slopes of the Tian Shan and the mountainous region which must now take the place of the Tarim-Hami desert. While I remained at Lukchin collecting historical data, visiting the ruins of the Uighur and Idihote or Dike-yanus cities, and making notes ethnographical, statistical, and economical, my brother went to the Chol-tau and Tiuge-tau mountains, whence he returned on the twenty-second day with a very interesting survey and two fine specimens of a new species of mountain sheep (*arkar*).

From the date of our arrival at Lukchin our collections of birds, fish, and mammalia made rapid progress, but with regard to reptiles, amphibia, and insects, only an occasional specimen was secured. The most interesting acquisition in the first of these groups must doubtless be considered a very curious frog, found in the warm springs of Chiktym and Lukchin-kyr, where it was in perfect health in spite of frosts ranging down to -7° Fahr. Here it fed on water bugs.

Before speaking of the very rich fauna of the Tarim-Hami region between the Tian Shan and Lob—this latter, let it be observed, being the district as distinguished from the lake Lob-nor—let me say a few words on the orography. The fall of the Tian Shan on both sides, north and south, is about the same, the defiles in either case being equally narrow; their difference mainly consists in their respective floras, the spruce-fir growing plentifully on the northern side, while the southern slopes are devoid of it. Here one remark must be made. Krasnof, in discussing this phenomenon, accounts for it by the theory that the main axis of the range intercepts the moisture-laden winds from the west-north-west, resolving them into rain and mist, so that the southern slopes, receiving but little moisture, cannot sustain forests, and are therefore only covered with a steppe flora. This explanation, however, is open to the following objection—when the range is divided into several parallel ramifications, the central being lower than those on either side of it, there yet occur forests on the northern slopes of all the chains, the southern having as before only a steppe vegetation; again, the spurs of the outermost of these parallel chains when facing the south are only covered with artemisia, whereas those with a northern aspect are forested, so that Krasnof's theory cannot possibly apply here, for it must be evident to anyone that the deposit of moisture on either side must be the same. Neither will his explanation account for another well-known fact. On all the mountains of Central Asia where there are glaciers, these are invariably longer on the northern side than on the southern, but since the axis of the chain retains the moisture and the glaciers start from it, there cannot be any great difference between the deposits on either side. All that has been said about the Tian Shan is also true for the Hindu Kush according to my own observations, and for the Kuen Luen according to the observations of Prejevalsky; and it should be remembered that in the case of the last of these mountain systems the rainfall comes from clouds borne northwards from the Indian ocean. All these facts admit of a more general explanation than that given by Krasnof, and I submit the following: the evaporation of any area is stronger in proportion to the greater warmth it receives; the southern slopes, always and everywhere more gradual than those facing the north (M. Krasnof's opinion notwithstanding), feel the influence of vertical solar rays while the northern slopes are only lit by them slantingwise; at the same time sunrise is earlier and sunset later on the southern sides of mountains than on the northern, as

every mountaineer so well knows and understands. Hence the flora of any given range depends not on the quantity of aqueous deposits, but on the position of that range; this is why, in the case of ranges situated meridionally, it is not the western slopes facing the north-west winds but the eastern that are forested. I had already remarked this fact in 1885, and had called attention to it in my work 'Le Pamir et sa faune lépidoptérologique.'

Thus the southern slope of the Tian Shan is deprived of arborescent vegetation, but not entirely; in deep defiles clumps of poplar and narrow-leaved willow and a variety of bushes find shelter; and it is worthy of remark that the farther east the greater the variety in the undergrowth. In places, though not everywhere, along the southern slopes, there are tracts of clayey sandy hillocks interstratified with loose conglomerate—the most barren parts of the range, only to be equalled by the gravelly steppe at its base. In defiles of these arenaceous formations the only plant to meet the eye is *Eurotina ceratoides*, the gravelly tracts presenting an occasional Ephedra and a kind of bush whose berries found their way into my herbarium.

The Turfan district is divided into two unequal parts by the small range of Tuz-tau, running parallel with the Tian Shan and composed of variegated clays, red clays interstratified with pebbles, and lastly with clayey sandstones overlying the pebbles, with veins of gypsum and outcrops of coal. Both parts are nearly equally barren. In the north the pebbly beds predominate, in the south salt marsh and drift sands year by year gain ground. Man is the cause of this change, for with marvellous energy he is ever burrowing beneath the surface to find water and lead it to his fields. South of Turfan our maps show an area probably designed to represent marsh land. If extended a little way to the north-east, this would approximately correspond with the floor of a depression continued between the Tuz-tau and Chol-tau ranges. Even within historical times this tract, as the words of a song testify, "*Anattyke djanliada*" (the great reeds of Anat* shake) was covered with famous reeds tenanted by wild boar, wolves, foxes, and other animals. At the present day nothing is left of these reedy tracts but mounds held together by the stumps, the reeds having been remorselessly cut down for fuel. There is even a special name for these reed stumps—*Chatkal*, and several settlements have adopted it. As the chatkal disappears, the sand held in place by it moves with threatening dunes towards the cultivated land and overwhelms it.

Here then we were witnesses of a marvellous struggle between nature and man. The native of Turfan, whose energy is astonishing, exploits his land so thoroughly as not to leave a drop of moisture in it—he takes it all; nature deprived of her portion dies, but in dying avenges herself on those who have robbed her, by laying waste their settlements and destroying their fields and gardens for the sake of which they robbed her so mercilessly. In this way the native of Turfan digs his own grave; there are but few spots left where the reeds can grow, and wild boar and other animals find shelter; doubtless, in course of time these too will disappear with the increase of population and the digging of more water-channels; then, restless mortal, beware, for thou shalt in vain contend against the sand-drift which has already half buried the suburbs of the city of Turfan!

The northern part of the Turfan lands is more happily situated; here water is more plentiful, and the soil presents the appearance of a pebbly steppe, affording but little material for the formation of sand-drift. As I have already stated, several rivulets descend the southern slopes of Nameless range, some of them scooping out deep channels in the pebbly soil; such are the Kok-yar and Utyu-azza; unfortunately they run to waste without benefiting the inhabitants. The natural water

* There is still a settlement of this name.

supply of the district is far short of requirements, though innumerable springs are scattered along the southern foot of the Tian Shan and Hami ranges. In the Tiuge-tau and Chol-tau mountains they are of rarer occurrence, and their water has generally a bitter-saline taste. But this mountainous country is of extraordinary interest to the zoologist, for there can be no doubt that it forms a remnant of an ancient continent once uniting the Kuen Luen and Altai by means of the Hami and Dzungarian mountains. From this point of view the road from Sha-chau to Lob-nor is very interesting.

But I have no intention of diverging from sober fact into the region of conjecture. My purpose is to interest you in this newly-discovered country explored for about 160 miles to the south of the Tian Shan, our farthest point being a valley confined between two ranges. Beyond this, for about 50 miles, according to the guide, the road to the south crosses at right angles range after range of mountains. That distance having been passed, the district round Lob begins, with its abundance of springs and pasture lands, continuing uninterruptedly to the Lob-nor marshes. There are no sands along this route, and a caravan of asses or camels may pass along it without difficulty. The road, too, from Lob-nor to Sha-chau is also easy; there are no waterless marshes here, and if disused, that is because there is no traffic to pass that way; all Chinese officials, however, going to Khotan from their own country, travel by it; and not long ago two Sarts, subjects of Russia, escaped this way from the Sha-chau prison, where they had passed seven years in confinement.

The northern limit of this mountainous country is the Chol-tau range, its name signifying naked or barren. Indeed the traveller might look in vain for springs and vegetation of any kind here; all is barren, and the monotony of the landscape is only relieved by whole patches of blood-red cornelians and bright jaspers of every hue and variety of pattern; but farther on he will meet with springs everywhere, luxuriant vegetation, and herds of antelope—in a word, food for himself and fodder for his cattle. The tamarisk, the briar-rose with thorns half-an-inch long, and the variegated poplar growing to a fabulous size, are objects that will arrest his attention. *Populus diversifolia* is particularly remarkable, with a stem as straight as a palm tree, and a girth of nine to twelve feet. There are reeds here tall enough to hide a camel, and vast areas covered with *Alhagi* and *Ephedra*, the haunt of many a boar. Wolves and foxes are so bold that they will carry off almost from under your very nose, and in broad daylight, the spoils of the chase; and lastly, wild cats (*F. manul*), wild camels, and wild sheep. All this will give you some idea of the vegetation and animal life of this region. One more fact has to be mentioned, viz. that from the meridian of Guchen to the westward for 40 miles, lies the district of Syngim, inhabited by agriculturists and the residence of a bek. The distance from Syngim to the Tarim is reckoned to be 53 miles, or two days' journey.

On existing maps the Nan-lu or southern road is quite erroneously rendered; in fact, for all that relates to the country beyond the Boro-horo range cartography is at fault. I am therefore well satisfied that, by a fortunate selection of routes, we have been able to fill in blanks for the countries bordering on the Tian Shan. One reservation, however, has to be made; we are specially indebted to the well-known cartographer A. A. Bolshef, and the not less accomplished traveller A. J. Skassi, for their advice and instructions before we left St. Petersburg, instructions the full value of which we only understood when we arrived here. Let the cartographical results of our journey show that we have toiled and laboured not altogether in vain. . . . As my brother was able, in spite of the severity of the cold, to fix two positions instrumentally along this road, it is to be hoped our survey will be free from error.

Between Chiktym and Lodun, a distance of 117 miles, we did not cross a single

rivulet; but there are several springs and wells, such as Kyrk-Ortun, Yanchi, Kuram-tash, Otun-koza, Chigi-chinza, Choglu-chai, and Wan-chandza. There is enough pasturage in spring and summer round the stations for the caravan animals at Yanchi, Otun-koza, and Chigi-chinza. Going in spring from Hami, with a small caravan and horses, one day's supply of fodder should be taken, though this is not indispensable, for at Choglu-chai there are always reeds on sale. We travelled this road in winter, and consequently suffered great inconveniences. We did two stages, or about 27 miles a day; the shortness of the winter day obliged us to rise at 1 a.m., drink tea and load our endless quantity of baggage in the dark in 20 to 25 degrees of frost; then we encountered severe north-easterly winds, whose icy blast froze feet, hands, and face. . . . It was some consolation to know that wherever we might have been at this season, our sufferings would have been the same. Particularly inhospitable were the defiles between Yanchi and Otun-koza. Heavens, what a storm that was! Owing to the extraordinary frost (nearly 2° Fahr. at mid-day in the sun), sitting on horseback was out of the question; but to make head against the wind accoutred in felt boots and fur cloaks was a difficult matter—yet we had to trudge, in spite of the wind which swept from the road not only the pedestrian but the laden horses.

From Chiktym to Lodun, the whole country is under the district governor of Barkul; at Lodun the Hami district begins, with its population consisting of Sarts, Dungans and Chinese. Here too, there are but few streams; springs however are plentiful, pasturage is good and brushwood is abundant, so that this country deserves its good reputation. The mountains, even their southern slopes, are forested with larch and poplars, though these trees are only found in the sheltered defiles and along the crest of the Hami range; lower down only one tree—*Populus diversifolia*—is met with, if we except the plantations round every hamlet. The poplar, however, is being ruthlessly destroyed. A great forest of it, once covering the Chigi-chinza valley, has been felled to a tree, only a few stunted specimens remaining, and there are no young shoots to take its place, only stumps 1½ to 2 feet in diameter. Rushes are common enough, and I counted six varieties of real bushes, and ten bush-like plants, most of them new to me, though as they were all without leaf or fruit, it was difficult to say. A specimen or two found their way into my herbarium, and in particular, one interesting plant from the neighbourhood of Yanchi, flowering in December in 25° of frost. The commonest plants here are reeds, two kinds of *Alhagi*, *Caragana*, tamarisk, a species of rose with broad, flat thorns, an *Iris* and a tulip with very large seed panicles, confirming the reports we had heard of the large size of its yellow blossom and long root-like leaves; besides these here and there grow couch grass and a small sedge.

Animal life in the Tarim-Hami region, including the neighbouring mountains, is varied and abundant. Eighteen kinds of wild animals may be counted, and seven of the smaller mammalia. The more common among them are *Felis manul*, *Canis vulpes* and *C. lupus*, *Sus scropha aper*, *Lepus* sp., two kinds of *Ovis* (*O. nov. sp.* and *O. Poli*), antelope, *A. subgutturosa*, *Cervus maral*, and a species of wild ass; of the smaller animals, a species of bat, *Erinaceus auritus*, three species of mouse, and a rodent to which we were unable to assign a genus or species. What we obtained will be stated below. I will now remark upon the interesting fact that in the above mentioned mountains there is neither badger, marmot, nor Alpine hare; we found no marmots even in the Bogdo-ola, or anywhere east of the meridian of Urumtsi.* I call the attention of naturalists to this

* Along the northern foot of the Boro-horo mountains marmots are so plentiful that the ground is often honeycombed by their burrows. Riding here at any pace is

circumstance with reference to animal distribution. Of wintering birds, I counted 57 kinds, but this number is only approximate, for new forms were daily met with, and the Hami Mountains were unexplored by us—they doubtless contain much that is interesting; probably too we might have found there nuthatches, red beaked crows, and large vultures, to say nothing of small birds.

The following is the classification of the birds to their orders:—Birds of prey, 15; Songsters, 21; Sparrows, 8; Doves, 2; Gallinaceous, 5 (6?); Aquatic, 4; and Waders, 2.

An interesting discovery was *Megaloperdix altaica*, in the Hami Mountains, another proof of these being distinct from the Tian Shan system where the Tibetan species of this partridge is only known to exist. It is true I mentioned the last named species among the birds obtained by us in the Bogdo-ola Mountains. Another interesting point is that Hami is the wintering place of several exotic forms, doubtless new to the palaearctic and ornithological faunas.

Our arrival at Hami nearly closed the first period of our journey; I say "nearly" because, before resuming our journey to the east, we hope to survey the region between Hami and Shaar-nor, and then, perhaps, that further to the south-west; we are only waiting for our horses to recover their strength, as they were so exhausted that they could hardly reach Hami, and we are without the means of buying fresh ones. This want of means deprived us of the possibility of undertaking an excursion from Lukchin to Syngym, an oasis on the Tiuge-tau mountains, important for us from several standpoints; firstly, an expedition thither would have thrown light on the Tarim-Hami mountainous country; secondly, we should have passed on our way thither localities abounding with wild camel and bears (according to the description, a new species); and lastly, we should have been in the centre of former settlements of the Kalmuk-Uighurs. According to reliable information there are very many Uighur ruins at Syngym; parties of treasure-seekers proceed thither annually from Lukchin and are not badly repaid for their trouble, for there are many gold and silver things there, besides copper vessels, censers, &c. These are at once melted down and sold to the smiths and brass-workers of Lukchin. In spite of all my efforts, I was unable to obtain any of these Uighur antiquities; not even Uighur writings, which, as I learned, are frequently found with grains of wheat in a particular kind of earthenware vessels; leaflets with inscriptions round them enclosed in horn and wooden boxes are also found, but these are so brittle that on being handled they frequently fall to pieces. This is all I was able to learn concerning Syngym, the existence of which nobody knew or heard of hitherto. Let me also remark that the Uighurs have left a memory behind them in the names of towns and places; such are Anat, Assa, Syngym, Astyn, and a number of others.

Having completed the sketch of the geographical and topographical results, I pass on to the other materials collected by our expedition, and first of all must mention the meteorological data.

The temperature of the air was taken as far as Urumtsi twice or thrice a day, and observations recorded of the state, of the sky with general remarks on the weather. These observations were continued for fifty days. . . . From Urumtsi, however, when our movements were less rapid and we were frequently stationary at one place for ten days together or more, it became possible to observe

a dangerous pastime, as your horse is liable at any moment to put his foot in one of these holes, and give you a nasty fall. In camp we amused ourselves by practising with the revolver at these little animals as they sat at the entrance of their houses.—M.

for temperature at shorter intervals of time, so that during five consecutive months, from the 1st August to the 1st January, 1890, observations were taken from five to nineteen times daily, and sometimes synchronously at different altitudes. . . .

In collecting specimens of the rocks, I adhered to the instructions of J. V. Mushkétov. Coal-fields were examined at Jirgalty, Fyho, in the neighbourhood of Urumtsi, near Lukchin, and at Turachi, in the steppe south of Nan-lu, within the Khanat of Hami; these last were the richest of the coal-fields we visited, and were employing a number of hands under the direction of an official of the Khan. It is almost unnecessary to say that we took specimens of the rocks both above and below the coal-seams, as well as of the coal itself. We also visited a burning coal-field in the mountains south of Shi-ho (Jirgalty). After a difficult and somewhat dangerous descent we safely reached the openings from which smoke was issuing by vents having the appearance of cracks, encrusted near their edges with crystals of sulphur, the surface being coated with a white substance. Some of these cracks, which were very numerous, emitted smoke, while others had apparently ceased to do so; here and there funnel-shaped cavities had been formed, whence issued thin but strong jets of steam; here, too, we observed the white deposit, but no crystals of sulphur. The whole of the soil was so hot that we felt it through the soles of our boots, the clay having the appearance of being baked; this and the numerous cracks made walking here a somewhat risky matter. This fire is visible from the River Ebteh and from Shi-ho, whence it has a striking appearance. We were unable to visit the naphtha springs near Urumtsi and the sal-ammoniac * beds in Central Dzungaria, but we obtained samples of both.

I only began a systematic collection of minerals at Bogdo-ola, continuing it thenceforward as a separate branch of our investigations. When the strata were much distorted or lay at different angles, I had recourse to photography or the pen. 320 specimens were altogether collected.

The poorest part of our collections was the botanical. We had no hands to spare for the herbarium; therefore, while keeping a general diary and entering in it observations on the flora, I only preserved a few characteristic plants of each locality, and chiefly such as were unknown to me. In this way I collected 100 plants. Moreover, the flora of the spruce forests of the Tian Shan is so monotonous, and has been so thoroughly studied, that it would have been presumptuous in me to suppose that I should find anything new in this belt, the more so as my botanical knowledge is very limited. . . . On the Bogdo-ola, however, I happened upon a remarkable plant growing in the rock detritus at an enormous altitude. Knowing as I do, from my former explorations, the appearance if not the names of the species of the upper zones, I consider this plant as exceptionally rare and peculiar. Imagine a large cabbage, the head of which is replaced by a flower six inches in diameter, and you will have some idea of its appearance. Unluckily, in descending the Bogdo-ola we were overtaken by very heavy rain, the slopes became slippery, and all we could do was to take special care of our hypsometer and photographic apparatus. The plant was left behind, but, fortunately, fearing that it might lose its appearance in drying, we photographed it before starting. One of the negatives turned out to be excellent, and I think a fair description might be written from it. All parts of the flower, the position of the leaves, stalk and root may be seen from it.

The largest of our collections are the zoological, these numbering 14,000 speci-

* Sal-ammoniac obtained in the caves and fissures of Ak-tagh, the fire mountain of Bishbalik, as the region between Urumtsi and Ili was called, was collected by the natives who paid their tribute to the Emperor of China in this product in the eighteenth century. Ritter's 'Asien,' l.c.—M.

mens. The vertebrates comprise 110 mammalia, viz. 29 large, 39 of medium size, and 42 small. The most interesting specimens, in our opinion, are four of *Equus Przewalskii*, and two mountain sheep from the Tiuge-tau Mountains. Among the medium-sized animals, *Felis manul* and *Canis corsac* from the Hami range are of special interest, and a *Lagomys* from the Tian Shan, of which we have 15 specimens.

We have 380 birds, a comparatively small number, owing to the circumstance already mentioned of their not being in plumage in summer, so that of ten killed perhaps two might be fit for preserving. Even in September the birds had hardly done moulting, and the collections were poor; later on they began migrating. We observed no great flights, with the exception of cranes and small flocks of mallard and pintail, teal and gray goose. We were, however, somewhat tied by the instructions I received from the Academy of Sciences, to turn our attention chiefly to hawks and small birds of prey, and on no account to collect any of the waders and swimmers, as Prejevalsky had brought so many of these. It will be readily perceived that this would reduce the number of kinds available for our collection by two-thirds. Of course we did our utmost to fulfil our instructions in the best possible way, and the results obtained fortunately surpassed our expectations. In order to estimate our collections at the proper value, it will suffice to bear in mind that of the 380 specimens there are 97 crows, one large hawk, 12 horned owls, 8 screech owls, 3 other raptorial birds, and altogether 121 of this last order (or 30 per cent. of the whole number). . . .

With regard to fish, reptiles and amphibia, our collections are far from being as completed as we could have wished them to be. We have in round numbers 50 specimens of fish, and about the same number of amphibia and reptiles. The only lake we came to was the Alpine one of Bogdo-ola, absolutely devoid of fish; in the larger rivers we also did not find any fish, either in the Boro-horo or to the east of Urumsai, so that we had only springs and marshes to fall back upon, and in these we secured about ten kinds. The collections of amphibia and reptiles might have been increased in number, but I guarded myself from doing this, as I judged it quite unnecessary to take dozens of *Ablepharus deserti* and such kinds common all over Central Asia. To our regret even Dzungaria proved to be unusually deficient in reptiles; there were or one two kinds of lizards, no more, in the sands between Guchen and Gashun. I met with no representatives of the genus *Stellio*; the commonest forms of lizards, as usual in Central Asia, were *Phrynocephalus* and *Eremias*, and in the cultivated tracts *Ablepharus deserti*. Of the snakes two kinds of *Trigonocephalus* are interesting, both found at considerable heights, and the common viper never before, it appears, met with in the Tian Shan. Among the amphibia were *Bufo variabilis*, everywhere common, and therefore not added to the collection, and a very interesting frog, possibly a new order and species. This was found in the warm springs of Chiktym, where it existed comfortably though the thermometer marked 25° frost.

All the rest of the collection, numbering about 13,000 specimens, were insects belonging almost exclusively to the two orders Coleoptera and Lepidoptera. Of these I shall say nothing here.

To finish with our zoological materials, I will remark that all our mammalia have perfect skulls, and we also took the skulls of a few specimens which for some reason had been rejected for the collection, among others that of an old arkar or mountain sheep (*nov. sp.*) We also exerted ourselves to obtain a complete skeleton of *Equus Przewalskii* of medium size. All this together increased the weight of our baggage so materially that we were obliged to buy extra horses and disburse all our spare cash on forage, but the temptation was so great we could not resist it.

In concluding my report, which notwithstanding my wishes to the contrary, occupies far more space than I had intended, I must mention that in my spare moments, and they were few, I did not sit with hands folded, but occupied myself diligently in collecting statistical and ethnographical materials, in this way a vocabulary of the Chan-tu * or Chentu dialect was formed, the customs and songs of this people written down; even their trade, economy, industry, &c., were not forgotten. Of course in a short time it is impossible to acquaint oneself with the inner life of a people, but this becomes possible when you are stationary in one place a month or more, and the people among whom you are living had been, however slightly, known to you before. This was my case with the Chan-tu, a people allied with our Sarts. I acknowledge, however, that with my inferior knowledge of the language and the necessity of conversing with them through the medium of an interpreter, I found it a tedious and thankless task. All that I could do some days was to write down and translate one of their songs. It was easier to make notes on their domestic economy, and on this head I can command interesting and I think complete materials.

In completion of the above itinerary I borrow a few particulars from a letter of M. Ed. Blanc, dated from Tashkend, December 22nd, 1890, published in the 'Compte Rendu' of the Société de Géographie (No. 5, 1891.) M. Blanc passed three days in the company of the Brothers Grijimailo, when the travellers passed through Tashkend on their way home. He says that after leaving Hami they crossed the Gobi to Su-chau by Morgol, Yan-dun, and An-si-chau, then by way of Gao-tai, Han-chau, and Yun-chan. At this last point they branched off to Sining, and thence to the Hoang-ho, crossing this river at Gui-dui. Hence they advanced southwards to the foot of the mountains bordering Sze-chuen, where Prejevalsky was stopped on his third expedition. It was doubtless here that they were turned back by the Chinese authorities, as announced in the newspapers. Retracing their steps to Gui-dui, they afterwards skirted the west shore of Koko-nor, having previously passed to the east of it and regained Su-chau by a new route, arriving at the last-named town in September 1890. They then returned to Kuldja, and proceeded by the usual post road via Verny to Tashkend.

The map we give is a reproduction of the one published in the 'Izvestija' to illustrate their journey as far as Hami. Special prominence is given in it to M. Grijimailo's theory of a division of the mountain ranges into two separate systems, Tian-shan and Altai. This and the mountainous country south of Turfan is new to cartography. It is to be regretted that no heights are supplied, but these will probably appear later when the scientific observations made by the expedition are worked out. The original map is without projection, which we have not attempted to supply, as it was found that by doing so several places would be thrown out of position.

* Cf. Col. Mark Bell's interesting paper, published in our 'Proceedings,' February, 1890, p. 85.—M.

GEOGRAPHICAL NOTES.

Nyassaland and British Central Africa.—Early in April Mr. H. Johnston, c.b., leaves England to assume his new functions as H.M. Commissioner and Consul-General in British Central Africa. Among the members of his staff are Lieutenant Bertram Lutley Sclater, R.E., and four non-commissioned officers (three from the Engineers and one from a cavalry regiment), who will aid Mr. Johnston in organising a police force and in conducting a careful and authoritative survey of Nyassaland, and eventually of all British Central Africa. The Council of the Royal Geographical Society has recognised this mission as one of great importance from the geographical point of view, because, with the exception of the excellent work done in the Shiré Highlands by Consul O'Neill, much of Nyassaland—to say nothing of British Central Africa generally—has never been surveyed by a trained observer, and its natural features being incorrectly laid down, are liable to shifting and occasional disappearances on successive maps; a matter of inconvenience in these days when Africa is being partitioned among European Powers, and some hitherto vaguely known rivulet or mountain may spring into importance as a landmark or a boundary. The Society has therefore provided a complete outfit of surveying instruments for the use of Mr. Johnston and his staff; and hopes that the result will be a much more accurate and complete map of this interesting region than that we now possess. Mr. Johnston is desirous, however, that his work shall not be merely confined to the "dry bones" of geography. He hopes to make a careful study of the anthropology, languages, zoology, botany, and geology of the extensive countries under his administration; and he has made an application to the Royal Society for help to enable him to employ a number of trained collectors in the different branches of natural history.

Mr. Joseph Thomson.—By telegram from Delagoa Bay we learn that Mr. Joseph Thomson returned to Blantyre from his mission into the interior west of the Shiré in February, completely successful. He remains at Blantyre for the present, his companion, Mr. Grant, returning at once to Cape Town.

M. Crampel's Expedition to Lake Chad.—The important expedition of M. Crampel, undertaken for the purpose of exploring the central region between the French territories on the Congo and Lake Chad, has made progress since our last notice.* Early in December last M. Crampel left Bangui, on the river Ubangi, for his land journey to the north. He was accompanied by four Europeans and 270 porters, and hoped to reach Baghirmi in about three months. For some weeks prior

* 'Proceedings R.G.S.,' 1890, p. 553.

to leaving the river he was engaged in exploring the Upper Ubangi. He succeeded in reaching Bamanga, the point at which the Ubangi cuts the fifth degree of N. lat., and turns south again. His survey agrees with that of Van Gèle's latest voyage in placing the most northerly point of the Ubangi half a degree farther north than it stood in previous maps, viz. at $5^{\circ} 11'$ instead of $4^{\circ} 38'$. M. Crampel also ascended the Kuango, the first great northern affluent of the Ubangi, for a short distance. Beyond the fifth degree the population on the banks of the Ubangi appeared to be dense; they possess great quantities of ivory and indiarubber. Several treaties were concluded with the natives.

Exploration in the Cameroons Region.—Lieutenant Morgen, who as the successor of Captain Kund has been for some time past engaged in opening up the interior of the Cameroons, has succeeded in crossing the interior from the river Sannaga to the Benué, and has thus connected recent explorations near the Cameroons with the surveys of Flegel and Zintgraff in Adamaua. Lieutenant Morgen started in October last from Jeundo station on the Upper Sannaga, and proceeded in a north-easterly direction to Tibati, which Flegel attempted in vain to reach. From this point he reached the Benué by way of Banjo. The natives along the river Sannaga still show themselves hostile, and several encounters took place with them.

Sir R. Sandeman's Tour in Baluchistan.—Sir R. Sandeman has returned to India by steamer from the Mekran coast after his tour in Southern Baluchistan. The country traversed by his expedition up to the Persian border is reported to be much more fertile and open than hitherto believed. The route followed by the party between Lus Beyla and Panjgur, which is about 60 miles from the Persian frontier, used to be the high road for all the trading *kafilas* between India and Southern Persia, but owing to the raids of the neighbouring tribes, trade has greatly fallen off. However, since the Government of India have stationed Baluch troops at Panjgur, cultivation is springing up and order is beginning to be re-established. The route from Karachi is not difficult; in many places abundant water is available and could be easily utilised, and the soil is good, but owing to the unsettled state of the country villages and cultivation are few and far between. Panjgur itself was visited by the late Sir C. Macgregor, and is described in his 'Wanderings in Baluchistan.' It is the junction of two routes, one from the Mekran coast via Kej, and the other from Karachi, by which the present expedition advanced from India. Panjgur is famous for its dates, of which twelve different kinds are cultivated. Sir R. Sandeman's journey southward to the Mekran coast resulted in the discovery of a good port at Kalmat, where there is forty feet of water inside the bar.

Indian Marine Surveys.—The Government of India have decided to employ their surveying vessel H.M.S. *Investigator* on the east coast of

Hindustan from January to April in each year (both months inclusive) in the following localities, viz. 1891 and 1892, Laccadiva Islands; 1893-5, entrance to the Gulf of Cutch, and coast between Bombay Harbour and Dahanu in 20° N. lat. The boat party will be engaged in November and December of each year in the following localities:—1890-2, Shat-el-Arab, Verawal, Jafrabad, Deogarh, Viziadrug, and a portion of Bombay Harbour. During the years 1893-5 the boat party will take up the survey of the harbours in the Gulf of Cutch and the coast between Bombay Harbour and Dahanu in conjunction with the *Investigator* herself. This programme differs from that submitted by Commander Carpenter, R.N., in his report two years ago, who recommended that the survey of the Burma coast from 20 miles north of Elephant Point down to the Terrible Rocks, as well as the coast from Sandoway to Cape Negrais, the mouths of the Bassein, Irawadi, and Sittang rivers, and other spots along the eastern side of the Bay of Bengal should have early attention. The Government of India concur in the opinion of Commander R. F. Hoskyn, R.N., who is at present in charge of the Indian Marine Surveys, that the east coast of the Peninsula should first be charted before the Burmese coast is taken in hand.

Expedition to Mount Yule, New Guinea.—An expedition equipped at the cost of the Geographical Society of Victoria left Port Moresby on the 14th November last with the object of reaching the summit of Mount Yule, one of the principal peaks of the mountain range of British New Guinea, the height of which was determined by triangulation by the *Bramble* Expedition of 1846 as 10,046 feet. The party is commanded by Mr. Belford, the companion of Sir W. MacGregor on his ascent of Mount Owen Stanley, with whom is associated Mr. Nettle, and four other assistants, eleven Papuans following as carriers. The expedition had the great advantage of Sir W. MacGregor's company who was on one of his administrative tours to the north-west, and landing the party at Maiva, a village on the coast beyond Yule Island, went with them several days' march into the interior. In the direct line of march they found an insurmountable obstacle in the broad swampy valley of a river, the Ngauauni, and were obliged to turn back and take a more circuitous route along the flanks of the hills to the north-west; and then for several days to cut a path through the bush to the summit of an elevation from which a good view of Mount Yule was obtained at about eight miles distance. Here Sir William left the party all in good health and with provisions and baggage all complete, on the 1st December. The native name of Mount Yule is Kovio. On this same journey the Administrator made peace treaties with some of the local chiefs, and purchased a tract of land on the banks of the St. Joseph river for a Government station.

Centre of Population of the United States.—In connection with the new Census, a calculation has been made as to the centre of population of the United States. The centre of population is defined as the centre of gravity of the population of the country, each individual being assumed to have the same weight. In 1790 the centre of population was at $39^{\circ} 16' 5''$ N. lat. and $76^{\circ} 11' 2''$ W. long., which would seem to be placed about twenty-three miles east of Baltimore. During the decade from 1790 to 1800, it appears to have moved almost due west to a point about 18 miles west of the same city, being in lat. $39^{\circ} 16' 1''$, and long. $76^{\circ} 56' 5''$. From 1800 to 1810 it moved westward and slightly southward to a point about 40 miles north-west by west from Washington, being in lat. $39^{\circ} 11' 5''$, and long. $77^{\circ} 37' 2''$. From 1810 to 1820 it moved westward and again slightly southward to a point about 16 miles north of Woodstock, Virginia, being in lat. $39^{\circ} 5' 7''$, and long. $78^{\circ} 33'$. From 1820 to 1830 it moved still westward and southward to a point about 19 miles south-west of Moorefield, in the present state of West Virginia, being in lat. $38^{\circ} 57' 9''$, and long. $79^{\circ} 16' 9''$. This is the most decided southward movement that it has made during any decade. From 1830 to 1840 it moved still further westward, but slightly changed its direction northward, reaching a point 16 miles south of Clarksburg, West Virginia, being in lat. $39^{\circ} 2'$ and long. $80^{\circ} 18'$. From 1840 to 1850 it moved westward and slightly southward again, reaching a point about 23 miles south-east of Parkersburg, West Virginia, in lat. $38^{\circ} 59'$ and long. $81^{\circ} 19'$. From 1850 to 1860 it moved westward and slightly northward, reaching a point 20 miles south of Chillicothe, Ohio, this being in lat. $39^{\circ} 0' 4''$ and long. $82^{\circ} 48' 8''$. From 1860 to 1870 it moved westward and sharply northward, reaching a point about 48 miles east by north of Cincinnati, Ohio, in lat. $39^{\circ} 12'$ long. $83^{\circ} 35' 7''$. In 1880 the centre of population had returned southward to nearly the same latitude which it had in 1860, being in lat. $39^{\circ} 4' 1''$ and long. $84^{\circ} 39' 7''$. During the past decade the centre of population has moved northward into practically the same latitude which it occupied in 1870. It has moved westward $53' 13''$, or 48 miles, its present position being in lat. $39^{\circ} 11' 56''$ and long. $85^{\circ} 32' 53''$. The centre of the area of the United States excluding Alaska is in northern Kansas, in approximate lat. $39^{\circ} 55'$, and approximate long. $98^{\circ} 50'$. The centre of population is therefore about three-fourths of a degree south and more than 17 degrees east of the centre of area.

Distribution of Population in the United States in accordance with Mean Annual Rainfall.—Mr. H. Gannett, the special agent of the United States Census Office, has just compiled a report on the above subject. From the materials available, data from nearly two thousand stations have been obtained, plotted upon a map of the United States, and the curves of mean annual rainfall, at intervals of 10 inches, sketched in

accordance with their indications, supplemented by our knowledge of the relief of the country and its known influence upon rainfall. In the following table the first column shows the grades, expressed in inches of rainfall; the second, third, and fourth columns the number of inhabitants found in each grade in 1890, 1880, and 1870, assuming that the total population at each of the above periods was 100,000; the fifth, sixth, and seventh columns show the density of population in each grade in 1890, 1880, and 1870, and the last two columns the increase in population per square mile.

Inches of Rainfall.	Number in 100,000 Inhabitants.			Population per square mile.			Increase in Population per square mile.	
	1890.	1880.	1870.	1890.	1880.	1870.	1880-90.	1870-80.
Below 10 ..	300	278	192	0·8	0·6	0·3	0·2	0·3
10 to 20 ..	2,612	1,385	949	1·8	0·8	0·4	1·0	0·4
20 „ 30 ..	6,038	4,343	1,909	8·1	4·7	1·6	3·4	3·1
30 „ 40 ..	34,107	34,969	36,644	43·1	35·5	28·6	7·6	6·9
40 „ 50 ..	39,459	40,984	42,719	59·0	49·2	39·4	9·8	9·8
50 „ 60 ..	16,164	16,734	16,212	25·1	20·9	15·5	4·2	5·4
60 „ 70 ..	1,274	1,271	1,358	18·1	14·5	11·9	3·6	2·6
Above 70 ..	55	35	17	4·1	2·1	0·8	2·0	1·3

It will be noticed that the main body of the population of the country inhabits the region in which the annual rainfall is between 30 and 50 inches, three-fourths of the inhabitants or thereabouts being found there. On either side, as the rainfall increases or diminishes, the population diminishes rapidly. It will be seen further that the arid region of the west, where the rainfall is less than 20 inches—a region which comprises two-fifths of the entire area of the country—contains at present less than 3 per cent. of the population. The greatest density of population is in the area showing 40 to 50 inches of annual rainfall, the average of this region being 59 inhabitants to the square mile. Next to that is the area having from 30 to 40 inches, where the density is 43·1. The most rapid increase, however, in population, is where the rainfall ranges from 20 to 30 inches; that is in the eastern portion of the Great Plains, ranging from Texas to Dakota, where the density has increased in twenty years from 1·6 to 8·1. The average annual rainfall in the United States is 29·6 inches. The average annual rainfall with relation to the population was, in 1870, 42·5 inches; in 1880 42 inches, and in 1890, 41·4 inches.

Geographical Prizes to the Training Colleges.—The Royal Geographical Society's prizes for proficiency in Geography in the late examination of students of training colleges have been awarded by the Government Examiners as follows:—Male students (scholarship 15*l.*), Herbert Vigrass, Saltley College. Prizes (books), R. M. Hayman, Exeter College; W. H. Freemantle, Exeter College; W. Jackson, Westminster College;

F. C. R. Frost, Westminster College. Female students (scholarship 15l.), Bertha Sills, Tottenham College. Prizes (books), Ada Taylor, Southlands College; Eliza Wood, Stockwell College; Silvester Schaeffer, Tottenham College (the last three equal); Elizabeth Sinclair, Stockwell College.

REPORT OF THE EVENING MEETINGS, SESSION 1890-1.

Seventh Meeting, 9th March, 1891.—The Right Hon. Sir M. E. GRANT DUFF, G.C.S.I., &c., President, in the Chair.

ELECTIONS.—*Rev. William Goyen; J. Hotchkiss, Esq.; Bowes Kelly, Esq.; Frank Pemberton Mockford, Esq.; Sasi Bhushan Sarbadhicary, Esq.; Fred. John Saunders, Esq.; Lieut. Bertram Lutley Sclater, R.E.; Capt. William R. Taylor; Lewen Greenwood Tugwell, Esq., M.A.; Lieut.-Colonel Henry Wylie, C.S.I.*

The paper read was:—

“Ptolemy’s Topography of Eastern Equatorial Africa.” By Henry Schlichter, Esq. Will be published, with maps and discussion, in a subsequent number.

Obituary.

Rev. R. M. Inskip, C.B.—We learn with regret of the death, on the 17th of December last, at Plymouth, of the Rev. Robert Mills Inskip, who had been a Life Fellow of our Society since the year 1852. He was a chaplain and the Senior Naval Instructor in the Royal Navy. After several years’ service abroad, including the operations in the Baltic during the Russian War, he superintended, in 1857, the fitting-up at Portsmouth of the *Illustrious* as a training ship for Naval cadets, which vessel was superseded by the *Britannia* in 1859, when he served as the principal Naval Instructor until his retirement in 1871.

He was the author of a work well known in the Navy, on Navigation and Nautical Astronomy, and in 1869 was awarded the civil C.B. for his services.

PROCEEDINGS OF FOREIGN SOCIETIES.

Geographical Society of Berlin.—January 3rd, 1891: Herr W. REISS in the chair.—The following papers were read:—“Journeys in the Cordilleras of the Argentine Republic,” by Dr. Ludwig Brackebusch; and “Northern German East Africa,” by Dr. O. Baumann.

—February 7th, 1891: Herr W. REISS in the chair.

THE VEDDAS OF CEYLON.

Dr. P. Sarasin reported upon the second journey to Ceylon, which he made in the spring of 1890, in company with his cousin, Dr. F. Sarasin. Unlike his expedition of the year 1886, which was undertaken in the interests of zoology, the journey in question was undertaken with the sole object of making an accurate anthropological study of the Veddas. Three races inhabit the great island. The Tamils, who are for the most part in possession of the east and north coasts and of the smaller islands lying to the north, and who belong to the Dravidian race of the Deccan; the Cingalese, who dwell in the west and centre of the island and have probably descended from the Aryo-Dravidian stock, inhabiting the plain of the Ganges; and finally the Veddas, who are the aborigines of the island. The pure,

unmixed Veddas, the number of whom is estimated at barely more than from 200 to 300, are found scattered through the forests of the eastern flats, and are very difficult of access, as the traveller is obliged to provide himself with the necessary provisions for a journey in those little explored regions. With a caravan composed of fifty coolies and an ox-waggon the travellers set out from Newara Eliya, whither they had arrived from Colombo, and in six days reached the eastern foot of the central mountain range. In the plains which slope away from this point to the east coast stand two small independent peaks, the more westerly of which is named Danigalahela and the other Degalahela; and it is in the hollows of the forests round Danigalahela that the still savage Veddas live. The great open grass flats are characteristic of these plains of Ceylon; they are surrounded by dense forest, and are covered with picturesque isolated groups of trees. The little villages of the so-called village Veddas lie in these clearings. The small huts, the walls of which are constructed of the bark of trees, consist of an inner room and a verandah, and are exactly similar to those of the Cingalese. In fact the Veddas themselves are not capable of building such huts; they get the Cingalese to erect them, and pay the latter for their services with the produce of the chase, meat, honey, and wild fruits. When unable to secure the Cingalese for this work, they are accustomed to seek shelter, like the rock Veddas of the mountains, in hollows, which are formed merely by detached blocks of gneiss lying on one or two sides, and afford but a poor protection against the rain and wind. Three different settlements of the village Veddas were visited by the traveller, and he was fortunate enough to discover a band of rock Veddas. Over 300 typical photographs were successfully taken. The Veddas have a chocolate-coloured skin; the nose is generally broad and fleshy, the lips swollen, and the chin pointed. The upper lip and chin, in the case of the men, are covered with a short growth of hair. The hair of the head falls down on the shoulders in the form of a dark mane, which is generally very unkempt. The hair is somewhat more curly than that of the Cingalese. The clothing of the Veddas is of a very primitive character, consisting only of a cloth rag round their loins, which is kept in its place by a girdle of twigs. The village Veddas have already partly intermingled with the Cingalese, and have acquired much of their civilisation. This appears from their domestic life, and their plantations, where they cultivate a kind of corn, red pepper, &c. The rock Veddas live principally on flesh, especially that of deer, swine, musk animals, monkeys, squirrels, guanas, while they despise buffaloes, leopards, jackals, and birds and their eggs. They dry the flesh over the fire, in order to preserve it. They also eat yams, which they bake, various fruits of the forest, certain leaves, fungi, and barks of trees. They also eat with relish the tender layer of cambium which lines the bark of the wild mango, and the rotten wood of certain trees mixed with honey. Unlike the Cingalese, they are very seldom clean; their hair is often very matted and full of vermin. They have no knowledge of the caste system of the natives of India, nor of any form of government, since they have no chiefs. The oldest man in a community appears often to exercise a certain influence, but it is of a very limited character. They possess no form of religion and no cult. Still they appear to believe that the dead become spirits, which they call Yakkas. This belief, however, did not prevent them from conducting the travellers to their burying-places, and assisting them in the exhumation of skeletons. The dance performed when the chase is unproductive, and the song usually accompanying it, are the only things which appear to have any connection with the Yakkas. The language of the Veddas is that of the Cingalese, which the Veddas have acquired in the course of time; but they still have recourse to their original language in the case of certain words. These words of the ancient language present great differences in villages which are often only a few

hours distant from each other. The civilisation of the Veddas is of the simplest kind conceivable. Bow, arrows, hatchets, two small pieces of wood for kindling fire, a tortoise shell for a bowl, a girdle for the waist composed of bunches of leaves and creepers; these comprise their whole household goods. The iron blades for the hatchets and arrows they buy from the Cingalese in exchange for honey, wax, and meat. No traces of stone weapons were discovered, although diligent search was made by digging in the hollows. The pure Vedda is characterised by an absolute absence of wants, an intense love for personal liberty, a marked sense of honour, which regulates their mutual relations better than written laws. Theft happens very seldom; a pure Vedda stands in contrast to the higher Indian races, who are often inveterate liars; murder only takes place in cases of invasion of conjugal rights, and then extremely seldom. As to the feuds and wars between the different races, nothing has yet been ascertained. The Vedda lives by nature as a rule, excluding higher conceptions, according to those moral perceptions of good and evil which for peoples higher in the scale of civilisation are prescribed as laws by the authors of religion. The Veddas appear not to have become acquainted with the idea of numbers; the word "Eka" (one) is the only numerical word in use. The travellers, proceeding by way of Batticaloa, returned to Colombo in a small steamer.

CHANGES IN THE EARTH'S AXIS OF ROTATION.

Prof. Forster, Director of the Berlin Observatory, read a paper on "periodical changes in the position of the earth's rotation-axis, and the measures taken for the closer investigation of these phenomena by international earth-measurement." One important effect of the periodical changes in the position of the earth's axis in the heavens has been known from very ancient times. The point, at which the prolongation of the earth's axis strikes the apparent celestial globe, namely the pole, or centre of the apparent daily revolution of the celestial vault, changes its position within the constellation according to certain laws, and within a long period of about 26,000 years, but also in shorter periods, ranging between $18\frac{1}{2}$ years and a fortnight. In the longest of these periods the northern pole of the heavens describes a circle round the corresponding pole of the earth's orbit, and the latter maintains its position in the constellation of the Dragon with but little alteration, while in about 12,000 years, Lyra or Wega will be the pole-star. Copernicus was the first to explain this occurrence consistently, as being a slow change in the position of the earth's axis of rotation, which was connected with the annual journey of the earth round the sun, but it was reserved for Newton to demonstrate that the cause of this phenomenon was the power of attraction, exercised by the sun and the moon upon the earth's mass flattened at its poles. Then Leonhard Euler, about the middle of the eighteenth century, investigated other problems connected with the free rotatory motion of the earth's mass, and proved in theory the existence of disturbances in the slow conical movement of the earth's axis of rotation, due more particularly to the changes in the symmetry of the distribution of the earth's mass, brought about by the processes of wrinkling, upheaval, and sinking of great portions of the earth's surface, as well as by irregularities in the distribution of land and water; later on, upon the basis of more accurate data as to the conditions of the earth's figure, the period for these changes was determined at nearly ten months. Up to the year 1820, there was, however, no series of observations sufficiently continuous and exact for the purpose of being adduced in confirmation or refutation of Euler's theory of the periodical change in the position of the earth's axis. The first astronomer who watched systematically for traces of such periodical changes, was Bessel. From his observations at Königsberg in 1820 and 1821, he came to the conclusion that such a movement of

the earth's axis could not possibly exceed half a second in extent. But he had already proved that the production of changes of position of the axis equal to one second would necessitate displacements of such enormous masses that everything which the power of man could effect on the earth, would be insignificant in comparison. The great natural transportation of masses through the successive and more or less regular periodical changes in the distribution of water on the globe, the shifting of the position of the great air and ocean currents, the effect of the evaporation of water in the equatorial regions and the depositing of the evaporated water in the form of snow and ice in the higher latitudes, in short the result of the circular motion following the seasons—all these mighty phenomena were left out of consideration by Bessel, as also by his successors in this field of investigation, the astronomers of the observatory of Pulkowa, Peters, Gylden, and Nyren, as well as by Maxwell and Newcomb, who studied, with reference to such periods, the observations made at Greenwich and Washington, but with little or no result. Sir William Thomson, in his address to the British Association (Glasgow), was the first to point out the influence of the variations in the distribution of the earth's bulk which occur under these conditions, and to show that under their influence it was possible for irregular variations to occur in the position of the earth's axis, to the extent of from one-twentieth to one-half of a second. If this view were correct, it was possible to explain why the former researches, which had not been capable of solution by the theory of Euler's period, had proved nearly resultless. There had now to be determined, by close observation, without any preconceived hypothesis, the reason for changes of geographical latitude occurring purely arbitrarily. Changes of this kind appear, with a certainty not hitherto observed, in the series of observations which Dr. F. Küstner had, with the greatest care, made in 1884 and 1885 at the Berlin Observatory, although originally for another purpose. The most prominent feature in the results of these observations was that the geographical latitude of Berlin decreased by two-tenths of a second from the spring of 1884 to the spring of 1885, and that the maximum variation in the whole series had exceeded from four to five-tenths of a second. Although this result was received among scientists with grave doubt, the Permanent Commission for International Earth-measurement of 1888 did not delay taking in hand comprehensive investigations, and giving pecuniary support to others. A simultaneous observation of geographical latitudes on Dr. Küstner's method was organised at Prague, Paderm, Berlin, and later on at Pulkowa, and from some five thousand separate determinations it was possible, in the spring of 1889, to prove that the phenomenon was not one determined by the local circumstances of the Berlin Observatory, but that the geographical latitudes of these other observatories had within the period named undergone changes of from four to five-tenths of a second. By this time it began to be seen that the theory would completely solve the problem, on the basis laid down by Sir W. Thomson. Investigations were carried out by Radau in Paris, and Professor Helmer in Berlin, with the result that the ten-monthly period calculated by Euler, is associated with the annual period required by meteorological processes, to a longer period of five years, in which five yearly periods coincide with six ten-monthly periods, so that the changes of latitude every five years undergo, during from two to three years a considerable increase, and during the rest of the five-yearly period suffer a diminution. This remarkable result of the theory also explains why it was possible to deduce from certain series of observations the changes sought for, but not from other series taken as unfavourable examples. In order to obtain further material for the elucidation of the question, the International Earth-measurement Commission will dispatch in the course of a few weeks a scientific expedition to Honolulu, which will

there carry out, under Dr. Marcuse, of the Berlin Observatory, observations for latitude continuously for one year. For if the variations of latitude are produced solely by the change in the position of the rotation axis in the earth's body, they ought to occur on the other side of the globe, antipodal to Central Europe, to a similar extent, but in an opposite sense. The speaker concluded with a reference to the general importance of the whole subject as demanding the co-operation of civilised peoples, and remarked with emphasis that *England would no longer be able to keep aloof from participation in international earth measurement*. For a general system of observation of these natural conditions, which are of such fundamental importance in all astronomical and finer geodetical measurements, will be established at the common cost, by means of about four observatories equally distributed over the globe, and then England will not be able to refrain from supporting a measure so important for the whole astronomical geodetical operations of the civilised world. Further, the speaker glanced at the possibility of the progressive change of the position of the axis of rotation, which, according to the statements of Helmholtz and Schiaparelli, may possibly have had very different positions in the earth's body in the course of the development of the earth.

— March 7th, 1891: Herr W. REISS in the Chair.

GROMBCHESKY'S JOURNEY IN CENTRAL ASIA.

Herr L. Conradt, who, as collector of zoological specimens, accompanied the expedition of Grombchevsky through Central Asia in 1889-90, read a paper on the subject. The party started from Margilan on the 1st June, 1889. The provisions required thirty-six saddle and pack animals for their transport. Crossing the Alai Mountains, the expedition arrived first of all in the two Bokharan mountain provinces of Karategin and Darwaz, where they were, by command of the Emir, well received. In consequence of the advance of an Afghan army into the hitherto still independent districts of Roshan, Shignan, and Wakhan, Grombchevsky's intention of penetrating into Kafiristan was frustrated, because the Emir of Afghanistan forbade entrance into these territories. Passing through the country of Vandj and across the great Sytargi glacier, the expedition returned to the Alai. From Daraüt-Kurgan the expedition marched in August over the Pamir plateau, having succeeded in obtaining a guide from the notorious robber Sahib Nasar. Passing through Sares on the Ak-su, Grombchevsky proceeded along by the great lakes of Jashil-Kul, Bulon-Kul, and Sor-Kul, which are uncommonly rich in fish, and made an attempt, but to no purpose, to penetrate over the Darkot Pass in to Chitral. On the Dagnyn-Bash Pamir, the expedition fell in with two English sportsmen, Messrs. Bover and Cumberland, obtained a glimpse of the peak of Mustagh-ata (26,000 feet), crossed over the Ily-Ssu Pass (17,000 feet), and advanced along the river Ily-Ssu as far as its embouchure into the Raskem or Yarkand Daria. The valley of the Ily-Ssu is covered with such dense forest that a path could only be made by means of the hatchet. On the way, at Masar, the expedition met with Captain Younghusband. The upper course of the Raskem, together with its side valleys, was then explored. This region was at one time fairly thickly populated, but it has now become totally deserted in consequence of the frequent inroads of the Kunjutes. An active trade in slaves flourishes in these parts of Asia; young girls are transported far hence into slavery. Through the Kugan Pass (17,000 feet) the expedition entered the basin of the river Khotan. In the Kirghiz "Aul" Shahidula (12,000 feet) a longer halt was made, in order to give rest to the much exhausted horses. With a temperature of -31° (Fahr.), a reconnaissance was made of the Kara-Korum Pass (18,500 feet); but the Indian Government did not give permission to the expedition to spend the coldest winter months in Kashmir.

Grombchevsky, therefore, made an attempt to penetrate by a new direct route to Polu in Chinese Eastern Turkestan, with the object of connecting his routes with those of Prejevalsky. With the assistance of an old gold-searcher, who stated he had already been over this ground once before, the march was begun at the end of December 1882, with the thermometer standing at -4° (Fahr). Passing along the valley of the Kara Gosh, and then through the pass (19,000 feet) named by Grombchevsky Russian Pass, the high Thibetan tableland was reached. With a frost of 54° Fahr. and sharp winds blowing, the whole expedition had to undergo terrible sufferings. The rarity of the air produced headache and giddiness in both men and beast, and in most cases such nausea that they could take no food. Completely worn out, the expedition encamped on the 30th December in the valley of the waterless Jurung-Kosh. The country was quite destitute of snow. The guide had fallen ill, and many of the horses had succumbed from weakness. Inasmuch as the expedition would have been lost in case of the death of the guide, it was decided to commence the return march. The whole of the baggage, with the exception of the money and the cartridges, was left behind at the foot of the Russian Pass. On the 1st January, 1890, the latter was again traversed with the thermometer at -31° Fahr., and some days later some Kirghizes were met with, who, in return for a large payment, brought the baggage which had been left behind, to Shahidula. The expedition had, on this foolhardy adventure lost twenty horses. The Kilian Pass, through which the party next passed, is very dangerous; the upper part of it is a glacier, and the pass is covered with hundreds of skeletons of asses and horses which have perished there. The travellers arrived at length, on the 2nd February, 1890, at a village, Kilian, where they were able to somewhat recoup their strength. From Kilian, Grombchevsky proceeded to Khotan (Ilchi), a place celebrated for its tapestry manufactories and its nephrite polishing. Advancing from here further eastwards, the travellers, at Nia, east of Keria, fell in with Count Pievtoff's expedition, which had been resting here in winter quarters for seven months. In the village of Surgak, lying to the south, there are about 30,000 men engaged in gold digging in the surrounding desert mountains. At the end of May, Grombchevsky arrived at last at Polu. The Chinese officials now put the greatest difficulties in the way of further advance. The people were forbidden, under the severest penalties, to sell provisions to the expedition or to furnish guides. At length, however, a guide having been procured by dint of bribery and force, the travellers crossed over the very difficult passes of the Kuen Lun. But on arrival in the plains of Thibet proper, it was found that the season (May) was still too early. There was no water anywhere, for the melting of the glaciers had not yet commenced. On the 22nd May a temperature of -11° (Fahr.) was recorded. At Gugurtlik the return journey had to be commenced, and, as the expedition had not got sufficient means to enable them to remain in Polu until July, it was decided to finally proceed homewards. Making frequent excursions into the neighbouring mountains, the travellers pursued their way through Khotan to Yarkand, where they again met Younghusband. From Kashgar, the expedition returned over the Kizil-Art Pass, Gulcha, and Osh, to Margilan, arriving on the 20th October, 1890, after having travelled 5000 miles in seventeen months. Referring specially to Chinese Eastern-Turkestan, the speaker said that this region, 320,000 square miles in extent, and inhabited by a million of people, is really a desert. It is only in the river system of the Tarim that there are oases of greater or less extent, where by means of artificial irrigation agriculture is practised, and wheat, barley, pease, maize, luzerne, and cotton are cultivated, and the breeding of silkworms is carried on. Peaches, apricots, pomegranates, grapes, walnuts, melons, apples, flourish in the greatest profusion. By means of the trade in these products, by gold mining and the cultivation of hashish,

there is a fairly brisk commerce with Russian Turkestan, Badakhshan, and India. The despotic and cruel government of the Chinese, at the head of which stands the Civil Governor (Dao-Tai), residing in Kashgar, and under him the Chief Commander (Sung Tung), who has about 10,000 men under his command, must soon, as the result of a revolution, give place to the Russian dominion, which possesses considerable sympathy among the Mohammedans of Central Asia.—Dr. M. Birchner, known to geographers by his journey to the Muata-Yamvo, then gave an account of a journey which he had accomplished in 1890, through Australia, New Guinea, Java, Japan, and China, for the purpose of making ethnographical collections.

NEW GEOGRAPHICAL PUBLICATIONS.

(By J. SCOTT KELTIE, *Librarian* R.G.S.)

EUROPE.

Baedeker, Karl.—Southern France, from the Loire to the Spanish and Italian frontiers, including Corsica. Handbook for Travellers. Leipsic, Karl Baedeker; London, Dulau & Co., 1891: 12mo, pp. xxvi. and 502. Price 9 marks. [Presented by the publisher.]

The present handbook for Southern France appears for the first time and corresponds with the third French editions of the 'Midi de la France' and the 'Centre de la France.' As is the case with others of the series, it is based on personal acquaintance with the country described. The handbook is divided into five sections:—I. South-Western France to the Pyrenees; II. The Pyrenees; III. South-Eastern France as far as the Rhone and Auvergne; IV. The French Alps; V. Cévennes, Valley of the Rhone, Provence, and Corsica. To each section is prefixed a list of the routes it contains. There are 14 maps and 19 plans.

Corti, Siro.—Le Provincie d'Italia sotto l'aspetto geografico e storico. No. 45. Regione Sarda. Provincia di Cagliari.—No. 46. Regione Sarda. Provincia di Sassari. Turin, G. B. Paravia & Co., 1891: 12mo., maps and illustrations.

ASIA.

Hart, Henry Chichester.—Some Account of the Fauna and Flora of Sinai, Petra, and Wady 'Arabah. London, published for the Committee of the Palestine Exploration Fund, by A. P. Watt, 1891: 4to., pp. x. and 255.

The author, in 1883, accompanied Prof. Hull, Director of the Geological Survey of Ireland, as a volunteer on a geological and surveying expedition to Sinai and the Dead Sea, with the main object of studying the botany of this region, and as far as possible also other branches of its natural history. The present volume, which has been brought out by the Palestine Exploration Fund, under whose auspices the expedition was made, embodies the results of this investigation. It commences with a connected account of the collections made in the order in which they were gathered, with such extracts from the author's journal as may serve to illustrate them. This is followed by an enumeration in detail of the various species which he has identified, concluding with a full account and analysis of the Flora of Sinai, or the Sinaitic peninsula of Arabia Petraea. In the descriptions next given of the Insecta, &c., Mollusca, Reptilia, Aves, and Mammalia, the author acknowledges the aid of specialists. There are two maps, besides a number of plates.

[**India.**]—Archæological Survey of India. South-Indian Inscriptions, Tamil and Sanskrit. Edited and translated by E. Hultzsch, *Ph.D.* Vol. i. Madras, 1890: 4to., pp. xi. and 183.

Sarbadhicary, S.—A Sojourn in India: her Manners, Customs, Religion, and its Origin. London, A. Andrews, 1890: 12mo., pp. viii. and 92.

AFRICA.

Alford, Charles J.—Geological Features of the Transvaal, South Africa. London, E. Stanford, 1891: 8vo., pp. vi. and 69, maps and illustrations. Price 5s. [Presented by E. Stanford, Esq.]

A sketch of the outlines of the geology of the Transvaal, from observations during three years of travel in the districts to the north and east of the Vaal river.

Budge, E. A. Wallis.—The Nile. Notes for Travellers in Egypt. With a map, plans, &c. London, T. Cook & Son, 1890: 12mo., pp. xv. and 311. [Presented by Messrs. Cook].

These "notes" are chiefly intended for travellers in Egypt whose time is limited. A brief summary of early Egyptian history is given, to which is added a few chapters on the history of the country during the rule of the Pharaohs, its people, the religion, and method of writing. An account is also given of the chief sights in and around Alexandria, Suez, and Cairo, followed by descriptions of the Pyramids, ancient tombs, &c., on each side of the Nile between Cairo and the Second Cataract (Wādī Halfah). At the end of the book is appended a fairly full list of the most important Egyptian kings.

Drummond, Henry.—Tropical Africa. Fourth edition. London, Hodder & Stoughton, 1891: cr. 8vo., pp. xiv. and 228, map and illustrations. Price 3s. 6d. [Presented by the Publishers.]

The first edition of this work was noticed in the 'Proceedings' for 1888, p. 475. With regard to Mr. Stanley's criticism on Professor Drummond's description of the African forest region, the author points out that his statements refer to quite a different part of Africa from that described by Mr. Stanley. The map of East Central Africa, showing the author's route, also indicates the various spheres of influence in this region.

Fotheringham, L. Monteith.—Adventures in Nyassaland: a Two Years' Struggle with Arab Slave Dealers in Central Africa. London, Sampson Low & Co., 1891: 8vo., pp. xiii. and 304, illustrations. Price 7s. 6d. [Presented by the Publishers.]

This is an account of a trader's experiences, from 1882 to 1889, in Eastern Central Africa. The volume largely deals with the troubles with the Arabs in Nyassaland during the latter part of this period.

AMERICA.

[America.]—Picturesque America. A delineation by pen and pencil of the Mountains, Rivers, Lakes, Forests, Waterfalls, Shores, Cañons, Valleys, Cities, and other, picturesque features of the United States. With illustrations on steel and wood by eminent American artists. Edited by William Cullen Bryant. 4 vols. London, Cassell & Co.: 4to, pp. (vol. i.) xi. and 278; (vol. ii.) ix. and 290; (vol. iii.) ix. and 287; (vol. iv.) ix. and 306. Price 8l. 8s.

These four handsome volumes mainly deal with the United States from a picturesque point of view. The profusion of illustrations for which the work is specially noteworthy convey, apart from the text, a good idea of the physical characteristics of the country, as also of its chief cities, towns, &c.

Heilprin, [Prof.] Angelo.—Explorations in Mexico. Barometric Observations among the High Volcanoes of Mexico, with a consideration of the culminating point of the North American Continent. [From the 'Proceedings of the Academy of Natural Sciences, Philadelphia,' August-October 1890.] 8vo.

—Explorations in Mexico. The Corals and Coral Reefs of the Western Waters of the Gulf of Mexico. [From the 'Proceedings of the Academy of Natural Sciences, Philadelphia,' October-December 1890.] 8vo., maps.

Heilprin, [Prof. Angelo].—The Geology and Paleontology of the Cretaceous Deposits of Mexico. [From the 'Proceedings of the Academy of Natural Sciences, Philadelphia,' December 1890.] 8vo, plates. [The above three pamphlets were presented by the Author.]

Le Plongeon, Augustus.—Sacred Mysteries among the Mayas and the Quiches, 11,500 years ago. Their relation to the Sacred Mysteries of Egypt, Greece, Chaldea, and India. Free Masonry in times anterior to the Temple of Solomon. New York, R. Macoy, 1886: 8vo., pp. xvi. and 163, illustrations.

Nelson, Wolfred, [C.M., M.D.]—Five years at Panama: the Trans-Isthmian Canal. London, Low & Co., 1891: 8vo., pp. xiv. and 287, map and illustrations. Price 6s. [Presented by the Publishers.]

This volume gives a good insight into the present condition of things at Panama. It treats somewhat fully of the early history of the isthmus, and discusses at some length M. de Lesseps' canal scheme its present condition and future prospects. The author resided for five years—1880 to 1885—on the isthmus, acting as a newspaper correspondent and as a practitioner of medicine. He thus had ample opportunities afforded him for studying the existing condition of things, and of seeing into the inner life of the people; his observations upon their habits and customs and mode of life should therefore be of some value. He has also much to say regarding the country, the climate, seasons, &c., also of old and new Panama, their past history and present condition. The information has apparently been brought up to date.

Thouar, A.—Exploration dans l'Amérique du Sud. Paris, Hachette, 1891: pp. 421, 2 maps. Price 3s.

This is an interesting volume, profusely illustrated, giving a graphic account of the author's perilous adventures in the centre of South America, while following the course of the Pilcomayo river in the Chaco Boreal. The first of his journeys was undertaken for the purpose of finding the survivors of the Crevaux mission. Starting from Arica he crossed the Bolivian Andes on a mule, and after a short sojourn in La Paz, reached Oruro. On the 25th June he arrived at Tarija, the last Bolivian town before reaching the Gran Chaco. At this place he fell in with a column of Bolivian troops about to start for Tejo, one of their forts on the Pilcomayo. Here they learnt from the Tobas Indians that search for the survivors of the Crevaux mission would be fruitless, as they had all been massacred. The Tobas are the most powerful tribe in those regions and occupy both sides of the river; they are very warlike, and well armed and mounted. They possess numerous herds of sheep, cattle, and horses; they are not cannibals. These Tobas, who are very indolent, attacked the expedition in hopes of plunder, but they were repulsed, and thirty of them killed. The progress of the column was greatly impeded by the rank vegetation, especially by the thorny cacti, called *tusca*. At the mission of San Francisco the country is so flat that there is no decided bed to the river. At Cavayu Repoli it divides into two arms with such low banks that the whole country is marshy, which accounts for Van Nivel, in 1841, returning with the impression that the river lost itself in the plains. Between the 23rd and 24th parallels the banks are higher, and in the dry season there is a depth of $3\frac{1}{2}$ to 5 feet of water. Between the 24th parallel and the Paraguay the river confines itself to the banks. After a very fatiguing march through a morass, they reached Asuncion on the Paraguay, on the 12th November, 1883. This journey was not accomplished without great hardships. The party were attacked frequently by Indians, worried at night by the jaguars, tormented by hunger and thirst, which necessitated their killing during the journey 42 out of the 131 mules and horses with which they left the Crevaux colony.

The author then describes his second journey to the delta and lagoons of the Pilcomayo, extending from July to December 1885. He has defined the southern delta of the Pilcomayo, and greatly added to the hydrographical and topographical knowledge of those regions. He also gives a good description of

his journey in 1886 from Buenos Ayres to Sucre, via Jujuy and Salta, dealing with all that is interesting on that route.

M. Thouar's third journey was a stupendous task, which he undertook to find a practical trade route between Bolivia and Puerto Pacheco on the river Paraguay, which the Bolivian Government have a great desire to open up. This route must cross the Chaco Boreal through an unknown district for 350 miles which has never been traversed on account of the famine of water. The explorer first followed the river Parapiti which flows in a N.E. direction to the lake Ancararenda, and then entered the desert for a long distance eastward, but was forced to retire, as he could obtain no water for his party, while the heat sent the thermometer up to 137° Fahr. On his return he was assisted by the Tupui Indians, who brought him fruit and vegetables and accompanied him to Carumbei. He then resolved that a route from the Pilcomayo would be the better, and started for the Crevaux mission, from whence he set out in a N.E. direction for Puerto Pacheco, which course he pursued with little progress for two weeks, to the Pampa de la Desolacion, which is an arid desert without a vestige of animal life; he was again forced to return to the Colony Crevaux. M. Thouar then made his third effort, and set out due east to reach the Paraguay, south of Pacheco. He pushed forward with twenty men, leaving the others at the colony. The Indians were jealous of his going through their territory and he was continually harassed by them; they attacked him when his party was decimated by hunger and thirst. In this plight he was rescued by Colonel Martinez who arrived most opportunely, and he returned leaving his mission unfulfilled.

His conclusion is, that to cross this wretched region a railway is the only means where ordinary travelling is impossible, there being neither route, water, nor pasturage for the traveller, who would be a prey to the treachery of the Tobas Indians.

The book abounds with thrilling adventures and narrow escapes, hardships only experienced here and peculiar to the country. The writer is well known as a fearless traveler, and his work cannot fail to prove of the utmost interest to those connected with South America, and all those who watch its development.

United States Coast and Geodetic Survey.—T. C. Mendenhall, Superintendent. Bulletin No. 19. *On the Sounds and Estuaries of Georgia, with reference to Oyster Culture.* A report by J. C. Drake, 1889-1890. Washington, Government Printing Office, 1891: 4to., charts.

AUSTRALASIA.

Brett's Handy Guide to New Zealand. Edited by E. Ernest Bloorgh. Auckland, H. Brett, 1890: 12mo., pp. 331. Price 4s.

This volume is primarily intended to serve as a guide for scenic purposes, but it will also be found to contain special information of interest to the agriculturist, the mineralogist, the settler, and the seeker after health. It is divided into six parts. The first part deals with New Zealand historically from the earliest times up to the present; the second part with the scenic beauties, wonders, and track routes, of the country. The third part forms a complete directory of all the important places in the two islands (with mention of Stewart Island), the objects of interest, excursions, &c., in their vicinity; together with the ports of call in Australia and Tasmania for vessels bringing passengers to New Zealand. The fourth part contains an alphabetical list of the health resorts of New Zealand, with special articles written for this volume by Dr. T. Hope Lewis. The fifth part gives the steamer routes to and in the country, tables of distances by land and sea, and various notes throughout New Zealand, with cost of same. The sixth part contains a deal of general information on the country, including its area, population, physical features, thermal springs, meteorology, vegetation, animal life, climate, rainfall, &c. The volume is illustrated from photographs, and with a series of maps.

No. IV.—April 1891.

[**New Zealand.**].—Report on the Statistics of New Zealand, 1889; with Maps of the Colony and Appendices. Wellington, 1891: 8vo., pp. xvi. and 224.

The introductory matter consists of a useful summary of the geography of New Zealand.

GENERAL.

Bulletin de la Société de Géographie. Septième série.—Tome xi. 4e trimestre 1890. Paris, 1890: 8vo.

This number contains the following papers:—Journey in Central Asia to the Pamir, by Gabriel Bonvalot; Pamir and Chitral, by Guillaume Capus, with a map; Journey of Paul Crampel to the north of French Congo, by L. Mizon, with a map; and continuation and completion of Studies on the Ancient Routes across the Pamir, by Dr. Nicolas Severtzow.

Cordier, Henri.—Le Colonel Sir Henry Yule. Paris, Imp. Nationale, 1890: 8vo., pp. 26.

De Costa, B. F.—Myvyrian Archæology: the Pre-Columbian Voyages of the Welsh to America. Albany, J. Munsell's Sons, 1891: 8vo., pp. 12.

Gribble, Theodore Graham, C.E.—Preliminary Survey and Estimates. London, Longmans, Green, & Co.

In this book the author addresses himself more particularly to the younger class of surveyors, whose professional duties may take them to the colonies or the United States. He deals with a large number of subjects, among others with practical astronomy, and gives an excellent chapter on tacheometry, which cannot fail to be of service to those who may desire to make themselves acquainted with this class of surveying. This book is full of practical information, and is well adapted as a work of reference for students of surveying and explorers.—[J. C.]

Knight, E. F.—The Cruise of the 'Alerte': the Narrative of a Search for Treasure on the desert Island of Trinidad. With two maps and twenty-three illustrations by Arthur Shephard, from the Author's sketches. London, Longmans & Co., 1890: 8vo., pp. 328. Price 10s. 6d. [Presented by the Publishers.]

In a previous cruise the small desert island of Trinidad was visited by the author, and a description of it given in his work 'The Cruise of the "Falcon"' (see 'Proceedings' for 1884, p. 103). The present volume is a narrative of three months' experiences on the island in a vain search for the treasure which is believed to lie buried under a landslip. This treasure was supposed to consist principally of gold and silver plate and ornaments, the plunder of Peruvian churches, which certain pirates had concealed there in the year 1821. The volume is useful as describing the island as it is at the present day. It is evidently subject to frequent landslips, and is uninhabited save by multitudes of land-crabs and sea-birds of various kinds. The vegetation at the present day is apparently confined to the summit of the island, which is covered with tree-ferns, a species of acacia, flowering grasses, and various other plants. Altogether the volume adds greatly to our knowledge of this out-of-the-way spot in the South Atlantic.

Leitner, G. W.—On the Sciences of Language and of Ethnography, with general reference to the Language and Customs of the People of Hunza. A report of an extempore address. 8vo., pp. 16. [Presented by the Author.]

Statesman's Year-Book, The.—Statistical and Historical Annual of the States of the World for the year 1891. Edited by J. Scott Keltie. London, Macmillan & Co., 1891: 12mo., pp. xxviii. and 1132. Price 10s. 6d. [Presented by the Author.]

Trotter, Coutts.—Memoir of Colonel Sir Henry Yule, R.E., C.B., K.C.S.I., LL.D., &c. [Reprinted from the 'Proceedings of the Royal Society of Edinburgh.'] (Read January 5th, 1891.) 8vo. [Presented by the Author.]

Verner, Capt. Willoughby —, Rifle Brigade, D.A.A.G. for Inst. South Eastern District. Map Reading for Military Purposes. London and Calcutta, W. H. Allen & Co. Limited, 1891.

This little pamphlet will be of service to those who are not acquainted with the use of maps in the field. It commences with an explanation of the signs and abbreviations used in military maps, deals with the system of contours, and concludes with some useful instructions as to the manner of setting a map either with or without a compass, and way in which one's place may be found on the map.—[J. C.]

Washington, [Major] F. P.—Lecture on the Methods and Processes of the Ordnance Survey, delivered at the Royal Engineer Institute, Chatham, 18th March, 1890. 8vo., pp. 21. [Presented by the Author.]

Yejeodnik Imperatorskago Russkago Geographicheskago Obshestva. Annual of the Russian Geographical Society. Part I. St. Petersburg, 1890, pp. 282.

This is the first number of a new series of publications under the able editorship of MM. Tillo, Mushkétov, and Grigorief.

The idea of founding a geographical annual or a review of all that had been done in Russia in geography is not new. In 1845 C. M. Baer edited a review in German of scientific work and travels, forming vol. ix. of the 'Beiträge zur Kenntniss des Russischen Reiches.' But this was not continued, and it was only in 1858 that regular reports were published annually on the more important geographical works. These began in 1858, and were continued till 1870, when on the retirement from the post of Secretary of Baron Osten Sacken, our Hon. Corresponding Member, the series stopped. In 1880 this gentleman read his summary of geography during the reign of Alexander II.; in 1881 the Society published in French for the Congress held in Venice a similar review; and in 1889 Baron Kaulbars compiled one for the Paris Congress on all the geographical works undertaken by Russians.

The present volume is the outcome of a resolution passed at a congress of Russian naturalists and members of the medical profession, held on the 7th January, 1890, under the presidency of A. A. Tillo. It is intended to be a collection of reviews of all the work done in the various departments of science—geodesy, topography and cartography, terrestrial magnetism, meteorology, geology, hydrology, botany, and zoology, as well as notices of travels in Russia by Russians and foreigners, including her Asiatic provinces. The first part now before us contains the following articles:—On the unification of geodetic surveys of the Russian Empire, by E. A. Koversky; geodetic, astronomical, topographical, and cartographical works undertaken by the War Ministry; hydrographical and cartographical works by the Ministry of Marine; meteorology in Russia, a sketch, by B. Sreznefsky; advances made in geological science in 1889, by S. Nikitin; various reviews of works on Russia and bordering countries, chiefly in Asia, for 1889; brief sketch of the work done by the statistical department of the Ministry of Communications in cartography and surveying, by I. P. Borkofsky; and lastly, the most recent geographical literature in general, together with a notice of geographical congresses held in 1889.—[E. D. M.]

The following Works have also been added to the Library:—

Cevallos, P. F.—Compendio de la Historia del Ecuador. Segunda edicion, Guayaquil, 1885: 12mo., pp. 501.

[Chardin, [Sir] J.]—Sir John Chardin's Travels in Persia. Never before translated into English. . . . Adorn'd and illustrated with a great number of Cuts. London, J. Smith, 1720: 2 vols. 8vo., pp. (vol. i.) 261, (vol. ii.) 333.

Gobineau, [Comte del.]—Les Religions et les Philosophies dans l'Asie Centrale. 2^{me} édn. Paris, Didier & Co., 1866: 12mo., pp. 543.

Macedo, [Mgr.] de.—Le Christophore, la Civilisation dans l'Amazonie. Conférence faite à Manaos (Bresil). 2^{me} édn. Paris, 1885: 8vo., pp. 62.

Maundrell, H.—A Journey from Aleppo to Jerusalem at Easter, A.D. 1697. Oxford, 1703: sm. 8vo., pp. 142, illustrations.

Mera, Juan Leon.—Catecismo de Geografia de la Republica del Ecuador. Segunda edicion. Guayaquil, 1884: 12mo., pp. 131.

Néry, F.-J., De Santa-Anna.—La Place de Para. Paris, 1887: 8vo., pp. 16.

Polak, [Dr.] J. E.—Persien. Das Land und seine Bewohner. Ethnographische Schilderungen. Leipzig, F. A. Brockhaus, 1865: 2 vols. (in 1) 8vo., pp. (vol. i.) xiv. & 389; (vol. ii.) viii. and 370.

NEW MAPS.

(By J. COLES, *Map Curator*, R.G.S.)

EUROPE.

Cassell & Co.—Map Building Series. Europe. England. Scotland. Ireland. Germany. France. Compiled and prepared by H. O. Arnold-Forster. Drawn and engraved by F. S. Weller, F.R.G.S. Cassell & Co., Limited, London, Paris, and Melbourne. Price 1s. per packet of twelve maps.

The object aimed at in publishing this series is to furnish a means of making the study of geography interesting to children, and to teach them the relative positions of places to one another by actual measurement on the maps, and thus to impress the facts on their memory. The plan adopted is to divide the whole map into squares, the size of which is regulated by the area embraced in the map, and from a given centre, by means of these squares, to measure the distances east or west and then north or south of the given point. These distances are given at the back of each map, and an intelligent child would no doubt be interested in fixing the positions of places by this method.

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(Stanford, Agent.)

ASIA.

Afghanistan.—Map of —. Scale 1 : 1,520,640 or 20·84 geographical (24 stat. miles) miles to an inch. Published under the direction of Colonel H. R. Thuillier, R.E., Surveyor-General of India. Calcutta, 1889. 4 sheets. Price 3 rupees uncoloured, 3 rupees 8 annas coloured.

After four years' delay, chiefly attributable to the political difficulties which appear to beset the production in India of any map of any territory beyond the British boundary, the new map of Afghanistan, embracing the results of

the Afghan Boundary Commission's labours, has at length appeared. Its delineation reflects credit on Major St. G. Gore, R.E., who compiled the N.W., S.W., and N.E. sections, and Major C. Strahan, R.E., who is responsible for the S.E. section; but it is a little regrettable that such a lengthy period of preparation should not have led to the inclusion of a somewhat larger area of country. General Walker's map of Turkistan, the precursor of the present document, embraced a far wider region than this map, which does not extend much beyond the periphery of Afghanistan. There are many political questions connected with Kashghar, the Pamir, the lower Oxus, Eastern Persia, and Baluchistan which are all more or less interwoven with the affairs of Afghanistan, but the theatre of which falls outside the present map. At the same time there is a vast improvement here observable in the geography of Afghanistan proper. All the survey work executed during the Afghan war of 1878-79 is embodied. This has involved various important corrections, amounting to ten miles and more in the position of some of the chief towns, and to over 500 feet in the height of some well-known points. The mapping work executed during the Waziristan, Takht-i-Suliman, and Zhob expeditions has been shown, as well as the important reconnaissances carried out by Colonel Tanner and Sub-Surveyor Ahmed Ali Khan on the borders of Kafiristan, and in Astor, Gilghit, &c. But the most important feature of the map is, of course, the incorporation of all the valuable surveys and reconnaissances executed in connection with the Afghan Boundary Commission. These number in all about eighty-four, and were carried out by Major Holdich, Captains Gore, Talbot, Peacocke, Maitland, Yate, and Barrow, and Sub-Surveyors Imam and Yusuf Sharif, Hira Sing, Abdulla Khan, Ata Mahomed, and Saïad Ulla. All this work has covered the face of the country with a vast amount of topographical detail, so that the blank spaces are now few and far between. The route from Nushki via Galichah to the Helmand, and along the course of the river to its terminal swamp or lake, is now fully and accurately plotted. The country all around Herat, Badghiz, the Firozkohi, and Taimani country have been mapped out. The last two were explored by Hira Sing and Imam Sharif, and their surveys have resulted in the delineation of two previously unknown tracts of historical interest, and the discovery of several ruined cities. The course and upper waters of the Heri-rud, Murghab, and Balkh-ab are mapped out for the first time with any pretension to accuracy, and the entire range of the Hindu Kush, with its dependent spurs, assumes quite a different appearance. The map is picturesquely drawn, the hills being clear and the lettering neat, though small, and the entire compilation will be a valuable help to Oriental students, as well as to those interested in the relations between India and her western neighbours. The Surveyor-General of India (who is of course not responsible for the delay attending its production, which was due to political causes) is especially to be congratulated on one of the neatest as well as most important maps ever issued by the Indian Survey Department.—[C. E. D. B.]

Asia Minor.—Spezialkarte vom westlichen Kleinasien, nach seinen eigenen Reisen und nach Anderen grösstenteils noch unveröffentlichten Routenaufnahmen bearbeitet von Heinrich Kiepert. Scale 1:250,000 or 3·4 geographical miles to an inch. Zweite Lieferung. Inhalt: Begleitworte, Bl. 3, Ismid; 4, Adramyti; 5, Balikesri; 8, Alashehr; 13, Kös. Berlin, Dietrich Reimer, 1890. Price 12s. (*Dulau.*)

The second part of this important map has been delayed in publication in consequence of Dr. H. Kiepert having received information from M. Aslan-Effendi, Chief of the Bureau Topographique, Constantinople, of important details in topography which have been omitted in the sheets of this map already published, and which it was necessary to use in the maps contained in the present issue; and as this could only be done by employing the services of an experienced topographer resident at Constantinople, some unavoidable delay has taken place. In the letterpress accompanying Part II. a list of the corrections to be made in the maps already issued is given, and the author hopes to be able to publish the last part, containing five sheets of maps, during the present month.

The manner in which the map has been produced leaves nothing to be desired; the hill shading is very effective, the lettering clear, and great pains have evidently been taken to make the map as complete in its details as possible. All ruins, villages, convents, and places whose positions are uncertain, are distinguished by symbols, an explanation of which will be found, in German, English, and French, on Sheet I. A list of the authorities used in the compilation of the map will be found in the letterpress.

AFRICA.

Beira Harbour.—Authentic Map of — and surrounding country. Compiled by J. R. Pardy and P. A. Dörrbecker. Scale 1:394,200 or 5·4 geographical miles to an inch. January, 1891. St. Leger, lithos. (*Stanford*.)

Stevens, D.C., F.R.G.S.—Sketch Map of Proposed Railway Extension from Natal &c. By D. C. Stevens, F.R.G.S. A. C. B. Williams, M.S.A., Delt. Supplement to the 'Standard' and 'Diggers' News.'

Wissmann, Major von.—Karte der Gebiete zwischen Luluaberg und Nyangwe in æquatorial Afrika. Nach den Routenaufnahmen und Erkundigungen von Major von Wissmann in den Jahren 1880-83 und 1886-87, sowie den Fluss-Aufnahmen Dr. Ludwig Wolfs i. J. 1886. Gezeichnet v. Dr. B. Hassenstein. Scale 1:1,000,000 or 13·6 geographical miles to an inch. Petermann's 'Geographische Mitteilungen,' Jahrgang 1891, Tafel 5. Gotha, Justus Perthes, 1891. (*Dulau*.)

CHARTS.

Admiralty.—Charts and Plans published by the Hydrographic Department, Admiralty, in January and February 1891.

No.	Inches.	
1975	m = 1·37	England, east coast, river Thames :—Kentish Knock and the Naze to the West Swin, 3s.
1765	m = 2·5	Ireland, south coast :—Cork harbour and approaches, 2s. 6d.
1343	{ m = 7·2 } { m = 28·6 }	France, west coast :—Adour river from the entrance to Bayonne. Plan of entrance, 2s. 6d.
1596	m = 2·41	Italy, west coast :—Salerno bay, 6d.
1565	m = 4·86	Newfoundland, east coast :—Sops arm, 1s.
1421	{ m = 1 0 } { m = 2·0 }	Africa, east coast :—River Chinde. Bar and entrance, 1s.
664	m = 0·17	Africa, east coast :—Zanzibar to Melinda, 2s. 6d.
667	m = 2·0	Africa, east coast :—Port Melinda, 1s. 6d.
1760	m = 0·24	China, east coast :—The Brothers to Ocksen islands, including the west coast of Formosa from Wanckan bank to Nan sa sha river (plan, Tingtae bay, Red bay), 3s.
1388	m = 1·0	Australia, north-west coast :—Cambridge gulf, 3s.
1490	m = various.	North Pacific, Sandwich islands :—Harbours and anchorages—Waimea bay. Waianae bay. Hanamaula bay. Kaunakakai harbour. Kamalu harbour. Mahukona harbour. Puku harbour. Lahaina roads. 2s. 6d.
1454	.. .. .	Anchorages in Alaska :—Plans added—Kukak bay. North-west and Yukon harbours. South-west anchorage. Akun cove.

No.		
1457	.. .. .	Anchorage in Alaska :—Plans added—Captain's bay. Simeonoff island and harbour. Sammaganuda harbour.
1742	.. .. .	Canton river :—Plan added—Whampoa anchorage.
1377	.. .. .	Sandwich islands :—New plans—Kealakekua bay. Hilo or Byron bay.

(J. D. Potter, Agent.)

CHARTS CANCELLED.

No.		Cancelled by	No.
1975	River Thames, Kentish Knock, and the Naze to the West Swin	New chart, River Thames, Kentish Knock and the Naze to the West Swin	1975
1765	Cork harbour	New plan, Cork harbour and approaches	1765
1343	Adour river from the entrance to Bayonne	New plan, Adour river from the entrance to Bayonne	1343
1421	River Chinde	New plan, River Chinde	1421
664	From 6° 38' S. to 4° 23' S. ..	New chart, Zanzibar to Melinda ..	664
667	Port Melinda	New plan, Port Melinda	667
1760	Chauan bay to Port Matheson ..	New chart, The Brothers to Ooksen islands	1760
2210	Tendra peninsula.		

CHARTS THAT HAVE RECEIVED IMPORTANT CORRECTIONS.

No. 2154. England, south coast :—Newhaven. 2593. North Sea :—Ameland to Jade river, including river Ems. 74. Spain, north coast, Portugaleta and Bilbao. 2479. North America, east coast :—Black Rock and Bridgeport harbours. Newhaven harbour. 899. North America, west coast :—San Diego bay to Conception point. 758. Madagascar :—Cape St. Andrew to Antongil bay. 706. Madagascar, west coast :—Pasindava and adjacent bays, &c. 2762. South Indian Ocean :—Comoro islands. 460. Red sea :—Musawwá harbour. 655. India, west coast :—Port of Bombay. 941, b. Eastern archipelago :—Western portion. 934. Eastern archipelago :—Surabaya, Bali, and Sapudi straits, &c. 2354. Australia, east coast :—Cape Grenville to Booby island. 1937. Australia, east coast :—Port Albany. 437. Australia, north coast :—Albany Pass to Booby island. 2375. Australia, north coast :—Torres strait, western channels.

(J. D. Potter, Agent.)

ATLASES.

Cassell & Co.—Popular Atlas, containing twenty-four maps in colours by F. S. Weller, F.R.G.S. Together with a chapter on Statistical Geography, and an index to the maps. Cassell and Company, Limited, London, Paris, and Melbourne, 1890. Price 3s. 6d.

In addition to the twenty-four maps which this atlas contains, a large amount of statistical information is given in the introduction, and it is furnished with a good index.

Stieler's Hand-Atlas.—Neue Lieferungs-Ausgabe von ——. 95 Karten in Kupferdruck und Handkolorit, herausgegeben von Prof. Dr. Herm. Berghaus, Carl Vogel und Herm. Habenicht. Erscheint in 32 Lieferungen (jede mit 3 Karten, die letzte mit 2 Karten und Titel). Achtundzwanzigste (28) Lieferung.

Inhalt:—No. 54, Balkan-Halbinsel, Blatt 4 in 1 : 1,500,000, von C. Vogel. No. 55, Asien, Übersicht in 1 : 30,000,000, von H. Habenicht. No. 56, Nord- und Mittel-Asien in 1 : 20,000,000, von A. Petermann. Gotha, Justus Perthes, 1890. Price 1s. 6d. each part. (*Dulau.*)

In the present issue of this atlas, No. 54 contains sheet 4 of the map of the Balkan Peninsula, on which inset maps are given of the Dardanelles and Bosphorus, with notes on the system of orthography and the symbols employed in the map. It includes the Grecian Archipelago and the coast of Asia Minor. The heights are given in metres and the depths of the sea are indicated by contour lines from twenty to two thousand metres. No. 55 is an excellent general map of Asia and the north-eastern portion of Africa, on which the boundaries of countries and the extent of colonial possessions are clearly indicated by a well-chosen system of colouring. No. 56 is a map of Northern and Central Asia, the greater portion of which is of course occupied by the Russian Empire, the whole of which, including Russia in Europe, is shown.

Universal Atlas, The.—Complete in 28 Parts, including Index. Published by Cassell & Co., Limited, London, for the Atlas Publishing Company, Limited. Price 1s. each part.

The Universal Atlas, of which this is the first issue, is an English edition of Dr. Andree's well-known Handatlas, which created such a favourable impression when it first appeared in 1880. Although the original maps have been corrected to bring them up to date, the following suggestion with regard to detail may perhaps be usefully made. The colouring of the boundaries in the general map of Europe is purely political, and the young student may be at a difficulty to know what limits he is to place to the Continent where it reaches Asia. It would be well to mark the limits in a recognisable manner. Railways need still closer revision; for instance, the Arlberg line is omitted. The Col du Mont Iseran is an interesting instance of the gradual decay of error. For years a fictitious mountain of the name of Mont Iseran occupied a place in maps. A col, or pass, of that name does exist, but it is a small pass only, not traversing the main ridge of the Alps, and certainly not calling for insertion in a general map of France. The work of transliteration has been well done; but in a work of such magnitude, including considerably more than one hundred thousand names, it can hardly be expected but that some oversights will occur. In addition to the maps contained in the original edition, a number of new maps, specially prepared for the Universal Atlas, are to be given in the future issues; among these is mentioned a four-page map of England, a double-page map of Scotland, maps of Canada, Australia, of the Indian Frontier, and the Trade of the British Empire.

This Atlas is to be completed in 28 monthly parts, each of which is to contain from four to six maps, and it will be furnished with a copious index. Some idea of the estimation in which this atlas is held on the Continent may be formed from the fact that no less than 200,000 copies of the German work have been sold in Germany, and the special editions produced have obtained a large sale in other countries. It is also mentioned, in the notice which accompanies this issue, that the cost of producing the first edition alone was 50,000*l.*

The following maps appear in Part I.:—Egypt; South Africa; Europe; and France. They are drawn in a clear style, and have been printed in Leipzig for the Atlas Publishing Company.

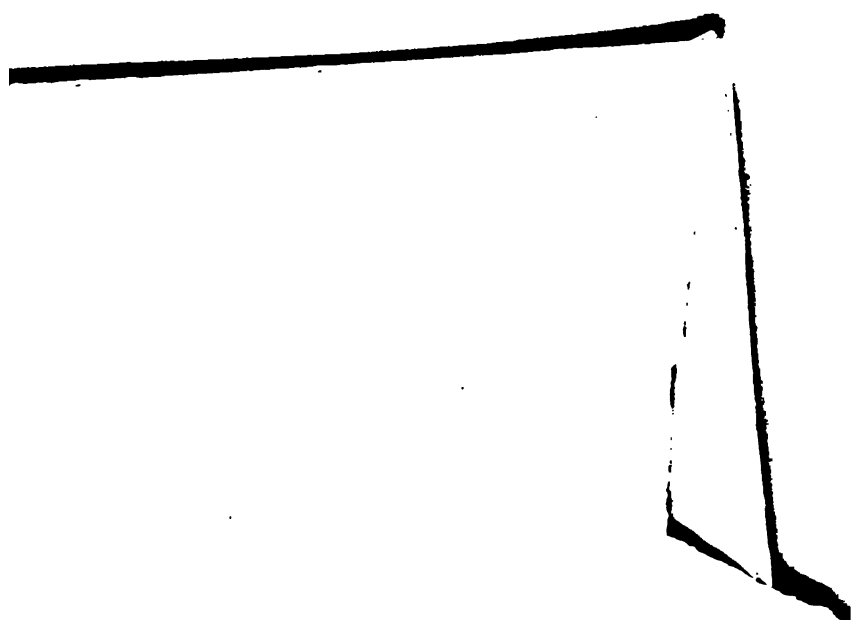
PHOTOGRAPHS.

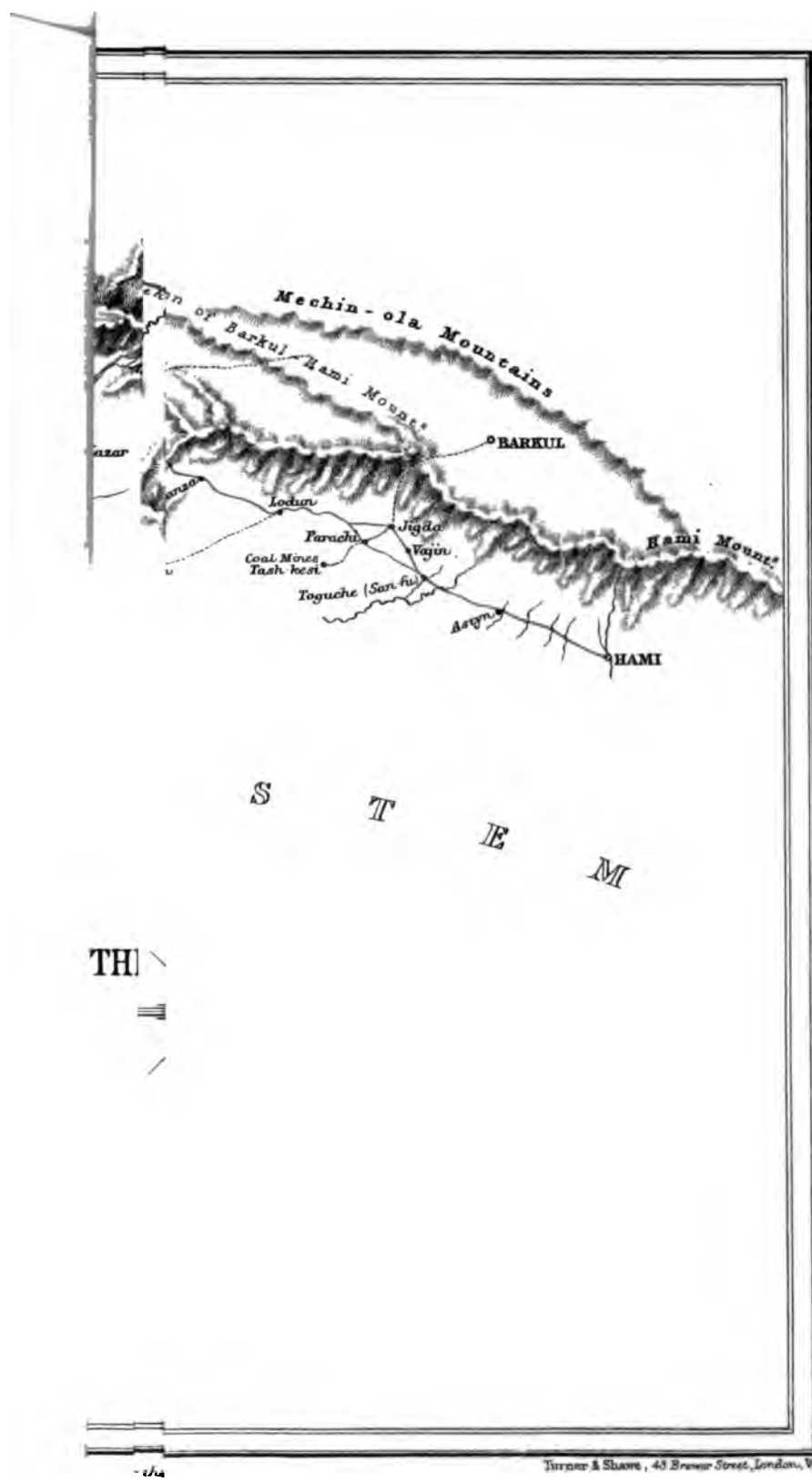
N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. When purchased photographs are presented, it will be useful for reference if the name of the photographer and his address are given.



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S T E M



PROCEEDINGS
OF THE
ROYAL GEOGRAPHICAL SOCIETY
AND MONTHLY RECORD OF GEOGRAPHY.

From Hai-phong in Tong-King to Canton, overland.

By A. R. AGASSIZ.

(Read at the Evening Meeting, February 23rd, 1891.)

Map, p. 312.

AT 11 a.m., on the 17th of February last, I left Hai-phong for Phu-lang-thuong, on board the s.s. *Licorne*, which steamer, the property of Messrs. Marty and d'Abbadie, runs regularly on this route, performing the journey three times each way every week. The actual steaming time for the trip is about eight hours; but as the delta of Tong-King is little above the sea-level, the rise and fall of the tides causes great fluctuation in the depth of the river; so it not unfrequently happens that the steamer is detained for half a day or more waiting for high water, which here only makes once every twenty-four hours. The saloon accommodation and the food supplied on board are good; but the passage money (seven dollars), which does not include the hire of a cabin, is rather high. For a cabin, which it is not necessary to engage unless the boat is detained, an extra charge of one dollar is made.

Within two hours of the time of our departure we had stuck in the mud, where we remained till 3 a.m. We eventually reached our destination at half-past eight.

Phu-lang-thuong is essentially a garrison town, as the foreign population consists of two hundred soldiers, but only seven civilians. There are two European storekeepers, who, as there is no hotel, are willing to supply accommodation to travellers. Their business is carried on almost entirely with the military, any little trade that is done with the natives being done by Chinese compradores, of whom there are five or six in the place.

From here to Langson, a distance of nearly 80 miles, there is a fairly good road, which has been constructed at great cost by the French Government. A number of ravines are spanned by light iron bridges, designed by M. Eiffel, of Eiffel Tower renown. There are no towns, and only a few very small villages on this route; but at distances of about

15 miles apart are military posts, at each of which is a captain, a lieutenant, and a number of soldiers. Certain parts of the road are considered unsafe on account of brigands, or, as the French call them, pirates; and it is therefore customary for travellers to wait in Phu-lang-thuong till a convoy from Hanoi for Langson passes, and then to follow the convoy. On enquiry I found a convoy had left Phu-lang-thuong at 6 a.m. on the day of my arrival, and would spend the night at Kep, the first post on the road. At this place, after a two hours' drive in a carriage kindly lent to me for my journey to Langson, I overtook it.

The convoy consisted of ten European and forty Tong-Kingese soldiers, commanded by a lieutenant. They were protecting about twenty waggons loaded with military stores, and fifty to sixty coolies carrying merchandise.

During the late Franco-Chinese war, much fighting took place in the vicinity of this post, a fact now testified to by the number of graves to be seen on all sides. Immediately opposite to the barracks is a small hill with a block-house on the top of it; here, so I was informed, the Chinese took a most determined stand, and the position, after a very hard struggle, was only captured by the invading forces at the point of the bayonet.

The barracks, the officers' quarters, and the post and telegraph office are built of bamboos, plastered with mud, the whole being surrounded by an earth wall and ditch. The native village consists of a few huts inhabited by persons employed by the garrison as coolies, or belonging to the road-repairing party. A small store, kept by a Chinaman, is all that exists in the way of commercial enterprise.

The next two stations named Bac-le and Than-moi, reached on the two following days, resemble Kep in almost every particular. No regular accommodation for Europeans is to be had at any of them, but there are in the barracks at each post certain rooms set apart for the use of travelling officers, one of which rooms I was, by the courtesy of the captain commanding, always permitted to use. I was also invited to put my horses in the military stables. This, at Bac-le especially, is a matter of much importance, as horses left outside at night have been taken by tigers. Paddy for horses to eat may be obtained at all these posts from the natives, but it is necessary for a traveller to be supplied with his own food, bedding, and wash-basin.

After leaving Than-moi the road is quite safe, so I did not remain with the convoy, which only moves at the rate of about two miles an hour, but drove on into Langson, a distance of 30 miles. Midway, at a place called Thien-ho, where the convoy would camp for the night, I rested my horses for a few hours. No soldiers live here, but a few Tong-Kingese have charge of some huts erected to afford shelter to passing troops.

A description of the country between Phu-lang-thuong and Langson may be briefly given as follows:—First stage, to Kep: country perfectly flat and well cultivated. Second stage, to Bac-le: hilly, with numerous groves of bamboo and tropical trees. Third stage, to Than-moi: very hilly, some of the hills being well timbered. Last stage: Cross mountain range, passing Thien-ho situated at the highest point reached by the road, which is probably not less than 3000 feet above the sea-level. Langson stands in the centre of a small plain at the foot of these mountains; the French portion of the town and the citadel on the left bank of the Sung-chi-Kiang river, and the native town on the right bank. The citadel, a space of about half a mile square, enclosed by a massive brick wall, contains the quarters of the garrison, and the house of the commanding officer. The civil officials, chief of whom is M. Unal, the Resident, who has charge of the town and district, live outside. During my stay in Langson I became much indebted to this gentleman for hospitality very kindly extended to me; in fact, while speaking of this subject, I may say that I have never in any other country met with such kindness as I invariably met with during the time I was in Tong-King. At whatever post or station I stayed for the night I was invited to dine at the officers' mess; and the way in which these gentlemen supplied me with information concerning the road, the surrounding country, or anything I inquired about, was as though the givers found pleasure in giving.

A few words concerning the Sung-chi Kiang river may not be out of place here. Its source is not exactly known, but I was assured by the officer in charge of the convoy with which I travelled that it enters Tong-King from the Province of Kwang-Tung. It then turns sharply to the north, passes Langson, and then flows on in the same direction to a place called That-khe, below which it is navigable for small boats. From here it takes an easterly course, and re-enters China (Province of Kwang-Si) at Ping-erh-kuang. At Lung-chow, 30 miles farther, it unites with a river called the Kao-ping-ho, which rises in Yun-nan, and crosses the north-east corner of Tong-King, passing the French garrison town of Cao-bang.

Formerly the French were put to much expense for the transport of stores to Cao-bang, as the stores, after being brought under convoy to Langson, had to be conveyed to their destination by coolies. Now, all things but munitions of war are sent from That-khe by boats, which descend the Sung-chi-chiang to Lung-chow, and from there ascend the Kao-ping-ho to Cao-bang.

There is not at present a railway in any part of Tong-King, but it is probable that a narrow-gauge line will soon be constructed from Phu-lang-thuong to Langson or That-khe. Hopes are entertained by some French merchants that this line will be a means of opening up trade with western Kwang-Si, which I think is very doubtful; but

as a military road, which is the purpose for which the Government intend it, it will be very useful.

The trade of Langson is small. Two French storekeepers do all the business that is to be done with the garrison, while the native trade is carried on in an open market. The goods offered for sale, which are spread out on the ground, consist for the most part of American and English cottons, soap, matches, umbrellas, and small sundries of European manufacture. Mirrors, brass basins, silk decorated pouches, opium-pipes, medicines and chinaware from Canton also find a ready sale.

Beyond Langson, in the direction of China, there is only a footpath, so I returned the trap to the gentleman who had lent it to me, and started on horseback for the frontier, about three miles distant. Midway, or rather within three miles of the boundary, is a small place called Dong-dang, at which there is a garrison of French soldiers, and a post and telegraph office. The telegraph line is constructed up to the frontier, and on the Chinese side the line from Canton through Nanning and Lung-chow has been extended up to the border also, but for some reason the Chinese decline to have the ends connected.*

At Chin-nan-kuan, after passing through a massive stone archway, I entered Chinese territory. There is a village here, but the town of Chin-nan is about two miles distant. Immediately inside the gate is the Yamen of the official who has charge of this inlet to the Empire. I was at once stopped, and my passport asked for, but as all was found in order I was permitted to proceed, and a guard of two braves given me. At Chin-nan these two soldiers handed me over to the care of two more, themselves returning. From Chin-nan to Pin-chiang, where I stayed the night, is about three hours' walk. I found the mandarin in charge to be a very pleasant old gentleman, and apparently well disposed towards Europeans.

Half-an-hour's walk from Pin-chiang is a place called Lin-ching, where General Sü, famous for his exploits in the late war, has his camp. The ground, which is about one mile and a half long by one mile wide, is well chosen, as it is almost entirely surrounded by high hills, one narrow pass affording the only natural means of ingress and egress. At the side nearest to Pin-chiang, which is the side opposite to the pass, steps have been cut over the hill, so that persons passing between the two places are saved a roundabout journey.

Between Lin-ching and Lung-chow are two roads, or bridlepaths, the old and the new. I chose the former; as the latter is the one most used by the military, and I thought that if I took it I should probably fall in with parties of Chinese braves, a class of people always to be avoided. No great amount of engineering skill has been displayed in the construction of the old road; in fact, all signs of construction are wanting. In some parts it crosses hills so steep that I was obliged to

* Since writing the above, the lines have been joined.

dismount and lead my horse. At about 4.30 p.m. I arrived at Lung-chow, quite tired out.

Lung-chow is a walled city, said to contain 20,000 inhabitants. Many of the houses are of the bamboo-and-mud style of architecture; but the Yamens, and the residences of the better class of the people are built of brick. Outside the city wall are three temples, one of which does duty as a French Consulate; another as custom house, and residence for the Foreign Customs staff; and the third as telegraph office.

The trade of the place may be divided into two kinds: that with other parts of China, and that with Tong-King. Under the former heading may be included all the trade in foreign goods, as the Lung-chow market is supplied from Pakhoi. Of the trade with Tong-King full particulars are given in the Imperial Maritime Customs Trade Reports, published quarterly.

The only article produced in the district, that is not wholly consumed locally, is sugar; which is said to be cultivated with much success. I walked through many of the cane-fields, but could not see any cane that in point of size would compare with cane I have seen in the north of Queensland. The fields would have looked better for being trashed.

Nearly every planter possesses his own crushing machine, constructed in the following primitive way: two stout hard wood posts are placed firmly in the ground about ten feet apart, and secured between them, at a height of one foot from the earth, is a plank two inches thick by ten broad. On this plank, standing on their ends, and almost touching each other, with their lower axles fitted into holes bored in the plank, are two hard wood rollers, of two feet diameter. These rollers are connected at their upper edges by cogs, so that one cannot revolve without the other. Above them, with holes for their upper axles to fit into, is another plank, secured to the upright posts at its ends. The upper axle of one roller is longer than the other and protrudes about a foot above the upper plank, with a hole bored through it, into which is fitted one end of a fifteen-foot pole. An ox, made fast to the other end of the pole, keeps the machinery in motion by walking round and round it; while a man, sitting on the ground, feeds the machine by placing the ends of the canes between the rollers, crushing five or six at a time. A trough beneath the machine catches the juice.

I examined some of the refuse, and found it still contained a quantity of sugar.

An ox-power sugar crushing machine made of iron, but in all other respects very similar to that used by the Chinese, has been introduced into certain parts of India, where it has proved a great success.

After remaining in Lung-chow for a fortnight I started by boat for Canton, on the 11th of March. Various kinds of boats may be hired,

the prices for the journey ranging from 50 to 150 dollars. A comfortable boat for one person costs about half the latter sum.

Below Lung-chow the river is called the Tso-Kiang or Left river; and is, as already stated, formed by the junction of the Sung-chi-Kiang and Kao-ping-ho; none of which rivers are marked on any of the English maps of China that I have seen. At the time I started the water was unusually low, and my boat, only drawing two feet, frequently scraped along the river bottom during the first few days of the journey.

Tai-ping, the only town of any size on this river, is situated on the left bank, three days' journey below Lung-chow.

On the 18th, four days after passing Tai-ping, we came to the junction of the Tso-Kiang and the Yü-Kiang, below which place, to its mouth near Macao, the river is called the Hsi-chiang, or West river.

The Yü-Kiang, navigable up to the town of Pe-se, has long been one of the highways to the province of Yun-nan; but during the past year the opening of the Red River in Tong-King, has taken away much of its trade. Nan-ning, the most important town in Western Kuang-Hsi, is favourably situated about six hours' journey below the junction of the two rivers.

Before saying more of the town of Nan-ning, a few words concerning the general aspect of the country through which I have been travelling may be inserted. Its chief feature, and certainly a most striking characteristic, is the peculiar formation of certain hills, which, as Mr. J. G. Scott has said in his book 'France and Tong-King,' are formed of a kind of prismatic limestone, and rise sheer out of the rice fields to a height, in some cases, of 1000 feet. The first of these hills that I saw was a range on the southern side of the military post of Bac-le, in Tong-King, after passing which I saw no more ranges, but numerous isolated hills. The mountains I crossed before entering Langson, which form the natural, although not the geographical frontier of Tong-King, are not of this formation. In the vicinity of Lung-Chow they are very plentiful, and in most cases have a peculiar turreted appearance. The river Tso-Kiang passes frequently close under their perpendicular sides, and at times, when I was descending that river by boat, it required but a small effort for me to imagine one of these hills to be the ruin of a huge mediæval castle. Below Nan-ning, I saw no more of them, but at rare intervals.

Nan-ning is a large town, in fact, in point of population, it stands third on the list of the towns of this province. The trade carried on between this place and Canton is very large; but owing to the number of Customs or "Lekin" stations along the river, only heavy goods are sent here by water. All light articles of merchandise, capable of being transported overland, are sent by coast steamers from Hong Kong to Pakhoi, and from there are carried to Nan-ning by coolies. Of course the natural result of the high duty levied on goods ascending the river,

or the expense of transporting them from Pakhoi, when they come that way, is to raise their price, and so to lessen the demand; many articles of foreign manufacture costing so much that none but the wealthy can afford to buy them. The British merchant might to some extent be compensated for diminished sales by money made out of freights if the carrying trade between Hong Kong and Pakhoi was in his hands, but German steamers, which are fast increasing in numbers all along the China coast, have monopolised this run entirely. On the other hand, till within the last few months, the Canton river trade, that is, the steamer trade between Hong Kong and Canton, has been entirely carried on by British-owned vessels. It is therefore evident that although the opening of Pakhoi as a treaty-port has benefited British manufacturers, it has not benefited our shipping interest.

What may be called the export trade of Nan-ning is much the same as Lung-chow; consisting principally of sugar, grown in the surrounding country, and timber. The place is also celebrated for the manufacture of lacquer-ware boxes.

At 11 a.m. on the 19th March I left Nan-ning, and soon entered a more open country. The river is broad, and in parts, for many miles at a stretch, seems well suited for the purpose of steam navigation. But, unfortunately, rapids are now and again to be met with. The worst of these we descended on the 27th. Before beginning the descent we engaged a few extra men from a gang who earn a living by rendering assistance to passing boats. We also took a pilot, and as an extra precaution for the assurance of our safety hauled our boat alongside the bank opposite to a small temple, where some of the crew, running on shore, offered up a few prayers for us. The outward and visible part of their worship consisted in burning a number of pieces of paper in front of a gilded image, while the supplicants bowed themselves, in some cases to the ground, before the same figure. I fancy that in the eyes of the priests, with which the temple seemed well supplied, a by no means unimportant part of the ceremony was the transfer into their pockets from those of the captain of my boat, of a few strings of copper cash (Chinese coins). All being ready we started, and were soon being rushed along down the rapid at a tremendous rate. The crew, fearing that with only the rudder to steer with, they would not be able to turn the boat quick enough to keep her off the rocks, ran a long oar, or sweep, out over the bow, and with this aid managed to keep in the channel indicated by the pilot.

In some places ridges of rock stretched almost across the river, and the water, being thus partially dammed up, would rush round the edge of a ridge, or through a breach in one, at a frightful rate. Twice it was necessary to cross from one side to the other of the river to round these ledges of rocks; and many were the close shaves that we had; frequently being within a foot or two of huge boulders, round which the

water would be foaming and splashing as we passed at what appeared to me to be something like railway speed. It took us a whole morning to pass the rapids, which are in reality a succession of rapids extending over several miles of river. Once through, we landed the extra men who had been engaged before we began the descent, and made fast the boats to a tree, so that the crew were able to get a well-earned rest.

On the 30th, I arrived at the junction of the Hun-shui-Kiang and the Hsi-Kiang, where is situated the town of Hsun-chow. Of the towns of Yung-chun-hsien, Heng-chow, and Kwei-hsien—situated, the first on the right, and the two latter on the left of the Hsi-chiang, between Nan-ning and Hsun-chow—I say nothing, as they are only small places, and my stay at them was very short, sufficient only to allow my passport to be examined by the Customs officials.

With Hsun-chow a traveller is likely to be disappointed, as its position induces one to expect to find a place of considerable commercial importance; which it is not. The city, surrounded by a wall, probably contains about 40,000 inhabitants; and as it is the chief town of one of the departments into which the province of Kwang-Si is divided, is a place of some official importance; but it has not the busy aspect of Nan-ning. This fact shows how large a proportion of the prosperity of the latter place is due to its overland trade with Pakhoi.

Below Hsun-chow the river is a splendid expanse of water, which might be rendered navigable to steamers by a slight expenditure of engineering skill.

In two days, after leaving Hsun-chow, I reached Wu-chow, the commercial capital of the Province. This place is Canton on a reduced scale. Its houses, built, some of them, close to the water's edge; its boats, with an enormous floating population—for people here are born, live, and die in their boats; and the dress, and the general aspect of the people as they busily pass along its crowded streets, all brought vividly before my mind's eye scenes with which I had formerly been familiar in the latter city.

The river Tan-Kiang, on which is situated the town of Kwei-lin, the official capital of the Province, here enters the Hsi-Kiang, making Wu-chow a turning point round which boats must pass when journeying between the chief towns of the two Kuangs, as the provinces of Kwang-Tung and Kwang-Si are frequently called. The Tan-Kiang is, like so many of the rivers of China, variously named on different maps: on some it is called the Fu-ho. What proportion of the trade of Wu-chow is carried on with Kwei-lin I am unable to say with any certainty; but that a very large share of the merchandise that reaches here from Canton, when not locally consumed, finds its way up the Tan-Kiang rather than the Hsi-Kiang, I am convinced. I arrived at this conclusion partly from enquiries made on the spot; and from the fact that boats

daily left Wu-chow for places on the former river, whereas I had met very few boats as I descended the latter.

Below Wu-chow, which place I left after a stay of only one day, the country is hilly, and the river deep, to the Shao-hing gorges, through which it passes, with hills rising on either side to a height of 700 or 800 feet. On the top of one of these hills is a large boulder, which resembles slightly the figure of a woman; and, as the boatmen have a legend in connection with it, is usually pointed out to travellers. The legend has already been given to the public in Mr. R. A. Colquhoun's book, 'From Canton to Mandalay,' so is hardly worth while mentioning here, but that it affords me an opportunity of speaking of a very curious superstition of the natives of Kwang-Tung, who believe that the women of western Kwang-Si are able to work a spell on people visiting their part of China, and in this way detain among them men who, but for the charm exercised over them, would gladly return home. I rather, for my part, suspect that the art thus resorted to by the ladies of Kwang-Si is one not unknown to some ladies in England; and the superstitious belief of the Canton wives often affords an excuse to erring husbands for a protracted absence.

After passing through the gorges I was detained for a few minutes at the Shao-Hing custom house, which is situated at the southern, or lower entrances. The town of Shao-Hing is on the left bank of the river, near the upper end of the gorge, but is not visible to passing boats, on account of the height of the river-banks at this part.

A short distance below the gorges the waters of the Hsi-Kiang are augmented by the Pei-Kiang, or North river; which is a very considerable stream, rising in the mountainous country on the borders of the Kwang-Tung and Kiang-Si provinces. Below this junction the Hsi-Kiang begins to split up, and finds its way to the sea through many mouths. The great branch enters the ocean near the Portuguese colony of Macao, and rightly bears the name of the parent river whose firstborn it is. Another branch, only second in size to the one already mentioned, is the Canton river, which enters the sea close to the historical Bogue Forts. Opposite to Canton this river divides into two branches, which lower down unite, forming the island of Honam. The larger of these branches, called the Back Reach, was the one most used for the purposes of steam navigation; but since the time of the late Franco-Chinese troubles it has been closed by a barrier, which makes it impossible for ocean steamers to reach Canton, as the other branch, called the Front Reach, is too shallow for any but light-draught river steamers to ascend. Ocean steamers have consequently, for the past five years, been obliged to discharge their cargoes at Whampoa, 12 miles below Canton.

The name "Canton River" is by some map-makers already erroneously applied to the whole of the Hsi-Kiang river. It would be as correct to call the river Ganges the "Hugli."

The distance between Wu-chow and Canton may be estimated roughly at 200 miles. I left the former at 4 p.m. on the 3rd April, and arrived in the latter at 10 p.m. on the 7th. I thus performed the latter third portion of my boat journey from Lung-chow, the whole distance being about 600 miles, in little more than four days. If I had been able to travel at this rate throughout the whole distance I should have reached Canton in about thirteen days after leaving Lung-chow: a feat which, although possibly unprecedented, would not, I believe, have beaten, by much, existing Chinese records; passages having been made between the two places, so I am credibly informed, in fifteen days.

With my arrival at Canton my journey ended; fifty days after leaving Hai-Phong. And here, too, my narrative would end also, but that I have a few words to say on the trade of western China.

By western China, as here spoken of, I mean the two provinces of Kwang-Si and Yun-nan; and when introducing the subject of their trade, I do not wish to speak so much of their productions, or the class of foreign goods likely to find a ready sale in them, as of the various routes by which such trade is to find ingress and egress. For convenience sake I will divide each of these two provinces into two halves, an eastern and a western, and will treat of each separately. Of the first part that we have to deal with, eastern Kwang-Si, little or nothing would have to be said, as it receives, and always will continue to receive, its supplies of foreign goods from Canton, so long as Canton remains the terminus of steam navigation, if it was not that this very fact requires certain notice. In fact, we are brought to consider why Canton should remain the terminus of steam navigation, which consideration brings us at once face to face with one of the great questions of the day in this country: the question of the opening up of the West River.

I have twice traversed the whole length of the West River, the journey here described being my second, yet I would hardly like to say to what point I think this river is fit, or may be rendered fit, for the purposes of steam navigation. But I do not hesitate for a moment to say that as far as Wu-chow there is no obstacle to the ascent of steamers drawing as much as eight feet of water. Small Chinese gunboats often run up to Wu-chow; I have myself seen one there drawing five feet; and was assured, in answer to enquiries, that in ascending it had not been necessary to use a lead-line or sounding rod, as there was any amount of water. Yet at this season of the year the water is always low, and this year is unusually so.

The question of the navigability of the river is therefore beyond dispute, and some other cause must be looked for by those who would find out a reason for the absence of steamers. To me there appear two reasons. In the first place, the whole of the floating population of Canton, Fat-shan, and the surrounding districts, and in fact the whole river population, would be instantly roused, possibly to arms, upon sight

of the first steamer. Few people who have not visited Canton and its vicinity have any idea of the number of people engaged in the carrying trade; or can imagine how these people by a general strike could paralyse every branch of industry.

The lower classes in China are not the down-trodden people that some persons in Europe suppose; and although the representative system of government is unknown in this country an equally good system exists, which has stood for centuries, and is undoubtedly better suited to existing circumstances than any other form would be. There is, I believe, no country in which the poor are more lightly taxed than in China; and in which public grievances are so speedily redressed; and, as the removal of an obnoxious impost is usually followed by the dismissal from the public service of the official by whom it was imposed, it is no matter for surprise that even the highest mandarins hesitate before taking a step which may cause dissatisfaction among the working classes. The degradation of an official not only means his removal from office, but in many cases brings with it the utter ruin of an entire family, as the system of competitive examinations for appointments in the Civil Service is so rigidly adhered to that it very frequently happens that men possessed of no private fortune, and therefore entirely dependent on the emoluments of their offices, have by repeated successes in open examinations risen to the highest posts in the State; no dignities but those of the Imperial family being hereditary.

Briefly, then, it may be said that the first difficulty in the way of the West River navigation is official fear of popular disapproval.

The second reason, as it appears to me, is one in which the upper classes would participate equally with the lower, as it touches the patriotism of a highly patriotic people. I allude to the introduction of a foreign flag on to another of the rivers of China. We can best imagine what the Chinese feel on this subject if we consider for a moment what would be our feelings if a foreign steamship company, Russian for instance, was to run a line of steamers on the Thames, between London and Gravesend; and by so doing was to keep a few thousand British subjects out of employment; while, as the result of their enterprise, they regularly remitted large sums of money to their Russian shareholders.

The Chinese possess a very fine line of steamers under their own flag, which was promoted, and is partly owned, by some of the highest officials in the country; and it is only reasonable to suppose that ere this they would have endeavoured to reap the golden harvest which the unopposed right of running on the West River would undoubtedly bring them, if they thought it possible. But they are of opinion that as soon as they send a steamer under their flag to Wu-chow, the foreign steamship companies owning steamers on the China coast, or Canton River, will at once demand the right to do the same.

In supposing that such a demand would be made the Chinese are

probably right; but whether the British Government would be wise to support the local steamship companies is another question. If by "British interests" we are to understand the interests of the majority of British subjects, or even of British capitalists, as being spoken of, and not merely the interests of a few individuals, I should say that it would be much wiser for the British Government to study British interests by discountenancing any such demands.

My reason for taking this view of the case is that as the Chinese can keep the West River closed as long as they like, unless indeed force or pressure is brought to bear on them, which is too absurd an idea to be entertained for a moment, they will continue to do so as long as they have any fear of foreign competition; and by so doing will continue, unintentionally, to keep partly closed a portion of their country which otherwise would be a good market for our manufactures.

What we want is that steamers should ascend the West River to Wu-chow. To whom those steamers belong, or under what flag they go, are matters which interest very few British subjects.

Nan-ning, the chief commercial town of Western Kwang-Si, as previously stated, receives its supplies principally from Pakhoi, to which place they are brought by coasting steamers from Hong-Kong. The cost of conveyance between Pakhoi and Nan-ning by the overland route is more than from Canton to Nan-ning by the West River; but the latter route is avoided by merchants on account of the number of customs stations at which they have to pay duty. The exact number of these stations I am unable to say, but I believe there are not less than ten. When the West River is opened, Nan-ning will, in all probability, draw its supplies from Wu-chow, supposing that place to be the terminus of steam navigation.

The French, since they acquired Tong-King, have been endeavouring to secure this trade to themselves, and the better to do so, are about to construct a railway from Phu-long-thuong to Langson or That-khe; the latter of which places is in direct water communication by way of the Sung-chi-Kiang and Tso-Kiang rivers with Nan-ning. And they were also wise enough to stipulate, when making their last treaty with China, that the duty levied on their goods after they have crossed the frontier, shall be collected by the Imperial Maritime Customs, which is a branch of the Chinese service managed by Europeans, chief of whom is Sir Robert Hart, the Inspector-General. A custom house, with a European staff, has therefore been opened at Lung-chow; and if French merchants ever have any trade along this route, they may thank those concerned in the making of the recent treaty for having secured them against the difficulties and delays which might have arisen if this custom house had been placed under native control.

Whether the French, even when their railway is constructed, will be able to send goods from Hai-phong to Nan-ning for less than they can

now be sent there from Hong Kong is doubtful. At present the returns of the Lung-chow Customs show that no goods of foreign manufacture have entered China across the adjacent part of the Tong-King frontier, but that, on the contrary, European goods occasionally pass from China into Tong-King; and, in Lung-chow, I have repeatedly seen traders leaving with a small load of cotton piece goods, matches, and sundries for the markets of Langson or Cao-bang.

With the province of Yun-nan trade has been formerly carried on either from Nan-ning by way of the Yü-Kiang river, or from I-chang by way of the Yang-tsze; I-chang being the highest point on the Yang-tsze to which steamers ascend. By the former route most of the trade with eastern Yun-nan has been conducted, and it is of this that at present we will treat.

Native boats leaving Nan-ning are able to ascend the Yü-Kiang as far as the town of Pe-se, close to the boundary of the Kwang-Si and Yun-nan provinces; and this place has long enjoyed, on account of its position, great commercial prosperity. But the opening of the Red River, in Tong-King, is quite abolishing the use of the old trade route, and Meng-tzu is fast monopolising the trade that formerly belonged to Pe-se. At Meng-tzu, too, the custom house is under foreign management, as at Lung-chow; and the trade returns, which are published quarterly by order of the Inspector-General of the Chinese Imperial Maritime Customs, Sir Robert Hart, show a continual increase. The following items are taken from the returns for the quarter ending 31st March, 1890.

Imports.—Cotton piece goods of various kinds, as shirtings, T-cloths, and Turkey red cottons, 7045 pieces. Cotton yarn, Indian, 267,500 lbs. Woollen piece goods, 991 pieces, and 89 pairs of blankets. Dyes, aniline, value 25*l*. Matches, European, 2999 gross; Japanese, 2957 gross. Soap, 607 boxes. Umbrellas, cotton, 452.

Exports.—Ground-nut oil, 27,860 lbs. Iron, manufactured, 10,306 lbs. Steel, 2173 lbs. Sugar, 30,982 lbs. Tea, black, 78,658 lbs. Tin, in slabs, 1,113,250 lbs.

Some of these items appear small, but the returns for a corresponding period of the year 1891, when published, will be sure to show a large increase.

Concerning the navigation of the Red River, it is as well not to overlook the fact that the "Service Subventionné des Correspondances Fluviales du Tonquin," of which Messrs. Marty and d'Abbadie, of Hanoi and Haiphong, are managers, has already built two steamers, the *Lao-Kai* and *Yunnan*, which have succeeded in reaching Lao-kai, on the Yun-nan and Tong-King frontier.

There is nothing more in this brief note that I can say of the trade with Eastern Yun-nan, so I will turn to the western half of the province, which borders on British Burma. The proximity of Bhamo to the China

frontier gives it an advantageous position for the purposes of commerce ; and when a railway has been constructed connecting this place with Mandalay, it is very probable that business will be carried on with adjacent towns in Yun-nan ; but whether merchandise from this source will ever percolate to any distance towards the interior of the province is doubtful.

A few remarks concerning this country, and the part it is destined to play in the affairs of nations, may, perhaps, not be out of place here. There are probably many people in England who are not aware that during the last ten years China's relations with the Great European Powers have undergone a complete change, but such is nevertheless the case.

Situated as she has been with such countries as Tibet, Tong-King, Burma, Korea, and Japan, over some of which she exercised sovereignty, as her neighbours, she has had little to do with other nations, and has found that "security in isolation" of which the opponents of the late Channel Tunnel project so often spoke. But now this state of affairs does not exist. France is in possession of Tong-King, for their Protection virtually means annexation. Britain has acquired Upper Burma ; and Russia, not contented with Mongolia only, is scheming to get Korea. This latter power (Russia) has long been a neighbour of the Chinese, and as two more neighbours, France and Britain, are now added, it is but natural to suppose that China will seek an alliance with one of the three as protection against the other two. To which China will turn is a question easily answered. Russian's designs are too palpable, France's blows too recent, for either of them to secure her friendship ; and if Britain does not get it, there will be no one but Britain to blame.

The tide of conquest flowed from east to west till the Turks stood before the gates of Vienna, it then turned, and for 300 years has flowed eastward. Now it has reached high-water mark, and will soon turn again.

The paper was read by the father of the author, the Rev. Rudolph Agassiz, Rector of Radnage, Oxon.

After the paper the following discussion took place :—

Sir ALFRED DENT :—I am afraid I know very little indeed about Tong-king or Southern China, but any one who has lived in China as I have, is credited with knowing about the country, although he may have resided in the north, some 2000 miles away. The paper which has been read this evening I had the opportunity of seeing a week ago, and thought it a most interesting subject, and am glad to see this Society willing to devote some of its evenings to explorations and expeditions in this part of the world. Tong-king, a few years ago, was hardly known, but the successes of the French armies there brought the place into prominence. In the Geographical Society's own journal, if you will refer to the numbers of 1886, you will see a very good account from Mr. J. G. Scott, who seems to have been attached to the French staff, and had many opportunities, therefore, of

seeing the country. He does not go, in that paper, very much into the question of geography, but points out one curious fact in connection with the rivers of China, and possibly of other big rivers in other parts of the world, how Hanoi, now about one hundred miles from the coast, used, in the eighth century, to be a sea-port. It is curious to see how these deltas are gradually marching into the sea.

Great importance has been attached to the Red River because some authorities fancy by its means the French will be able to tap the riches of Yun-nan. Yun-nan is supposed to be very rich in all sorts of valuable minerals, and we can but hope, for the good of China, that this will prove to be the case. Though the French are trying to tap these sources from the Red River, there are others pulling from Burma. You can approach Yunnan by the Irawadi and other rivers flowing into the Indian Ocean, and perhaps the Chinese have some idea of bringing these minerals down to Canton some day. We see by the map that, so far as Tong-king is concerned, a very considerable portion of it is very flat, but there are also high mountain ranges, and possibly great discoveries may be made there of mineral riches and other resources. With regard to the paper, I fancy that the particular journey Mr. Agassiz took has not been made before; we know that other travellers have been in that neighbourhood, Mr. MacCarthy and Mr. Colquhoun amongst them, but they have not been over the same ground. As to the Chinese, their system of government and mode of isolation, there is a great deal, of course, to be said by any one in any way connected with China. It is true, as Mr. Agassiz says, that a great change has come over China in the last ten years, yet the progress is spasmodic, and they split straws sometimes in the most peculiar way. As, for instance, it was some months before they connected the two wires at Lung-chow, but now there is a continuous wire, I suppose, from Hanoi to Canton. The Chinese have thousands of miles of telegraph already in their country, and we hope they will soon be induced to have many hundreds of miles of railroad, but there are many difficulties for railways with the rivers and graves, and above all, "fungshuey." Although Mr. Agassiz believes that the introduction of steamers to the Canton river will be the signal for a universal strike, this can be got over in other countries and will be got over in China. They have a teeming population there, and the question will arise some day, what is to be done with them all? We are very much exercised now over the Eastern question; before very many years have passed it will be the Chinese question; an enormous proportion of the world's population is Chinese, and must be dealt with. The Chinese are excluded from America and Australia, but they will go somewhere. The manufacturers of this country are trying to urge railways and loans upon China; but it seems to me that railways would bring the interior to the seaboard, and if this is done what is to prevent the accumulation of Chinese forcing their way into foreign countries? I am sure this paper has been very much appreciated. Mr. Agassiz is a young officer in the Imperial Maritime Customs of China, and the able way in which he has managed this expedition and the intelligent style in which he has written the paper, will make us wish to receive further communications from him.

Mr. CLEMENT F. R. ALLEN :—Having been consul for two years at Pakhoi, I should like to say a word or two about the trade. You will observe from the map that it is the nearest of all the ports to Europe, and as such I have heard it called, "the little backdoor to China." It is a place with a very good harbour that may be entered at all times of the tide without a pilot. Ships have to lie at some distance from the shore, but not sufficiently far to cause the transport from ship to shore to add very much to the expense of freight. Pakhoi, however, is nothing more than a good-sized shipping village; it is the port of Lien-chow, and at present it has little trade except up the river to a place called Yü lin and to Nan-ning. The trade is

hampered in a great many ways. In China there are three separate fiscal establishments, the Imperial Maritime Customs, the duties paid into which go to Peking; there is the Local Customs, and there is the *lekin*. By treaty we are supposed to be able to send our goods into the interior on the payment of a total duty of 7½ per cent. *ad valorem*, but the Chinese authorities object to this, and levy the *lekin* as well, and trade at Pakhoi has never developed as it might have done. Not only this, but the whole trade is a monopoly in the hands of one guild, the Macao guild—they run the small steamers on the line from Macao to Pakhoi, and it is practically impossible for any one else to ship by it. I remember, myself, when getting the materials to build the Consulate, I was charged three times the rate of freight in order to deter me from shipping. The steamers of the line are the most uncomfortable on the Chinese coast; they carry from Canton and Macao and Hong Kong a certain amount of piece goods, together with large quantities of kerosene, a great article of commerce, and bring back sugar, indigo, and pea-nut oil, and very large cargoes of live pigs carried on deck in crates; but until something is done to improve the trade of Pakhoi there will never be much worth having. Our hope is now that as the French are opening the railway, the Chinese, in self-defence, will be compelled to do the same, and will be forced to abolish or reduce their very oppressive duties. As a proof of how oppressive they are, I may point out that at Kwei-lin, the capital of Kwang-si, a large proportion of the foreign goods are brought by way of Shanghai and Hankow, 2000 miles further, simply because charges are so very much less than via Canton or Pakhoi. The province of Canton is a peculiar one, the Chinese of the north hardly look upon the Cantonese as fellow nationals. I have heard a Shanghai native remark, "there were seven Chinamen and two Cantonese." Those in the north call themselves the descendants of Han, those in the south call themselves the descendants of T'ang, Han and T'ang being the names of Chinese dynasties. The Cantonese are far more intelligent than the rest of the Chinese; moreover, they are either extremely inimical to us or extremely friendly. When Fuchow was besieged at the time of the French troubles, the Cantonese stood firm by their European masters. If we can develop our trade in the Kwang-tung province we shall be developing it with a fine set of men. But that we should in any kind of way form an alliance with the Chinese against either the French or the Russians is a thing extremely to be deplored, and I hope Heaven and our statesmen will defend us from it. What is for the benefit of France is for the benefit of England, and what is for the benefit of Russia is for the benefit of England too. We must treat the Chinese honestly and fairly, but where we put our foot down, I trust there we shall keep it tight.

The PRESIDENT:—If the excellent speech to which we have just listened is to be the last one of the evening, ladies and gentlemen, I am sure that you will agree with Sir Alfred Dent, who has a very good right to speak upon Chinese matters, that the paper to which we have listened this evening is highly creditable to the young officer—an officer only, I think, of nine-and-twenty years of age—to whose energy and intelligence we owe it. I doubt not also that you will think it right that I should ask his father, in your names, to convey to his son—who is, as I said at the beginning of the evening, in China—your approbation and gratitude.

Journey along the Southern Frontier of Nyassa-land.

By JOHN BUCHANAN, H.M. Acting Consul, Chilomo, Nyassa.*

STARTING from Chilomo, our path lay along the right bank of the Ruo for the first ten miles across an almost perfectly level plain, passing through chief Mkengwa's principal village, Pamambi, and thence Doa, Nchacha, Chipolopolo, and Ntengera. Owing to the recent Portuguese troubles several villages had been deserted, while on the other hand, new villages were being constructed by natives who had crossed from the other side.

A mile inland from the Shiré there commences an extensive belt of *Borassus* palm, which, varying in breadth from one to nine miles, extends from the Ruo to near Nkati, a distance, including a few broken tracts, of between thirty-five and forty miles. Nowhere is the result of the Portuguese invasion more apparent than in the number of those graceful productions of the vegetable kingdom, that now nudely stand as if protesting against the barbarous treatment they received at the hands of these ruthless intruders, who beheaded them for their life's blood. Giant baobabs and tall *njabe* trees stud the plain, and the umbrageous *kigaelio* is ever present. As one journeys on he comes suddenly upon patches of lawn, closely shaven by the incisors of the wary antelope, defined, it may be, by a fringe of dwarf palm, supported by a combination of other trees and shrubs, and the ubiquitous mimosa, which, though unmerciful to the feet of the unshod traveller, not only, when in flower, entrances the vision by presenting a solid semi-globe of golden blossoms, but diffuses around a fragrance such as only prodigally beneficent nature may indulge in.

Several miles of the plain are densely wooded with the more common types of the African forest, acacia, baubinia, pterocarpus, tamarinds, &c.; and at the foot of the hills the woods are primeval. There is to be had an abundant supply of firewood for river work, but so improvident are the natives, and so destructive their methods of agriculture in deforesting a district, that care will have to be exercised in order to maintain a supply of this article so necessary for river steamers. A very considerable amount of semsem is grown by the natives in addition to other crops of cereals along the banks of the Ruo, and it is hoped the acreage will this year be largely increased.

The river abounds in fish, and it is no exaggeration to say that in some places the water is literally black with shoals of yambo, golokolo, machenga, micheni, msuluwa, mambuli, makambali, and others, all more or less eaten by the natives, and some of which are welcome

* Communicated by H.M. Secretary of State for Foreign Affairs. The author has not sent a map of his route, but his route can be followed by consulting Mr. Last's map in 'Proceedings,' 1890, p. 256.

adjuncts to the white man's cuisine. Men and boys sit for hours at a time in some secluded spot on the river's bank, patiently plying the "gentle art," while others, less mindful of sport, resort to traps and weirs.

At Mtengera the first of the rocks known as Chichiri are visible. For some distance below this point navigation is difficult, but above the place it is impossible. A light draught steamer may ascend the Ruo at all times for several miles, and for months during the wet season as far as Chipolopolo's—about eight miles, while boats may ply as far as Mtengera, nine to ten miles, during the whole twelvemonth; but above the rocks no craft can be of use.

At this point the hills commence, and the path still following the course of the river crosses many undulations before reaching the spot where Mlolo from the left bank has chosen to establish himself. The country between Mtengera and Mlolo's, a distance of about five miles, is poor; the various undulations are covered with trees of small growth; the soil is thin and shingly. Near to and about Mlolo's it is different, there being less shingle and more earth.

Chief Mlolo I found awaiting my arrival. Ever since the first visit paid to him at Mongwe by the English he has proved staunchly friendly. Several times during the last twelve months he has requested British protection and the British flag, which request, owing to his being on the left bank of the Ruo, could not be entertained. Not to be done, however, and rather than submit to Portuguese sovereignty, he left his country, and crossed into the British Protectorate. This step meant to himself and his people a severe sacrifice, as they had to leave their well-stocked storehouses to the Portuguese troops, and live for months on what food they could scrape together from among their Manganja friends.

Mlolo, being a hospitably disposed man, deeply lamented the poverty of his position, in that he had not the means of treating me as he would wish to have done. I presented him with the British flag, greatly to his delight. His principal village, which consisted of a hundred or more huts, was still in the embryo stage, and before he could enter thoroughly upon the work of the field he had to present an offering to the spirits of his ancestors. This took place on my return journey—about three weeks after. I was present and witnessed the ceremony. The headmen and elders of the village assembled outside the chief's hut. Two young damsels were seated on the ground, each holding a small basket in her lap. The chief himself officiated as priest. He proceeded to transfer the contents of a flat sieve filled with flour into the small baskets, letting the flour fall gently through his fingers, the while enumerating his wants and desires in a kind of chant, while a principal headman at intervals called out, "Wopa, wopa!" which was intended for a strong seconding of Mlolo's statements, and was in turn

approved of by the elders, who unanimously clapped their hands in full assent. The next part of the ceremony was to adjourn to the banks of the Ruu, where, under a shady tree, an altar had been prepared. This consisted of a few withes stuck into the ground in a circular form, making an enclosure eighteen inches in diameter by about three feet high, a grass roof for which had been prepared and lay at hand. The two young damsels were seated as before. The ground within the enclosure was carpeted with a yard of blue cotton cloth. A small earthenware pot was pierced at the bottom and placed in the centre. Mlolo now took the flour in handfuls from each girl alternately, and carefully placing it within the altar by the side of the pot, again enumerated his wants, and beseeched the spirits of his ancestors to look favourably upon him and his people in their new home. The burden of his prayer was that he might be blessed with abundance of ivory and good crops, and, as a set-off against these requests, he brought prominently forward some of his good deeds, chief of which was his loyalty to and preference for the English, as evidenced by having left his country and some of his kindred rather than be cut off from British connection.

The flour having been duly deposited in the orthodox way, a vessel of native beer was next brought forward, and as each ladleful was decanted into the receptacle within the altar, he repeated his prayer as before, while the old man at his hand responded, "Wopa, wopa," and the elders of the assembly religiously clapped their hands in a solemn amen. The pot within the altar was now filled, notwithstanding its being perforated, and as the precious liquid streamed from within the sacred precincts, several young men, who had not tasted their beverage since crossing the frontier, voted libations out of place at such a trying time. The priest having notified that they had done their duty to their ancestral spirits, reserved a toothful of the beer, which led to a rather unseemly altercation between the assistants—notably he whose function it was to call "Wopa," and whose throat decidedly needed moistening. The ceremony being over, a general clapping of hands followed as a grand amen to the whole proceedings. The grass roof was placed over the altar. The calabash used in decanting the beer was hung on a branch of the tree overhead, and the company retired. Garden and field operations were soon undertaken in right earnest; and on my revisiting Mlolo's ten weeks later, many acres of forest had been cleared and planted.

Mlolo's villages extend for several miles below and above that in which he resides, which is situated partly on a promontory, jutting into the Ruu, and partly on a knoll lying in the bosom of a crescent-shaped ridge. One tall, solitary borassus palm stands as a landmark of former inhabitants long since gone.

Passing beyond Mlolo's, the path follows closely the course of the

river. Here and there it crosses belts of meadow, now under an umbrageous tree whose grateful shade invites the traveller to rest, then emerges to the water's edge, and so on for several miles, till it enters upon very rough and stony ground, trying alike to tender feet and shoe-leather.

At this part of the river its bed is one mass of rocks and boulders, the gneiss formation of which is beautifully evident. For several hundred yards the appearance of these rocks is as if a shower of snow had fallen on ground already frozen, and which had been blown into tiny wreaths of a wavy pattern, this appearance being due to the various strata having a sinuous form, and the rocks themselves polished by the wear and tear of ages.

At Nakale, nine miles above Mlolo's, there is a small village of that chief's people eking out a precarious subsistence. Our friends on the other bank made strenuous efforts to persuade the Nakale people that they had egregiously blundered in leaving Portuguese for British territory, only they would not see it. We found here an intact specimen of the bark canoes used in crossing the river.

Two miles further on you get the first glimpse of the Zoa falls; in another half-hour's march, during which you ascend several hundred feet, you stand on a level with them, and already begin to feel and breathe the bracing atmosphere of the mountains. Fifteen minutes more takes you to the village of Nhataombere, which is presided over by a swarthy dame, who placed her best residence at the disposal of the stranger.

For years past I had known that the Ruu abounded in miniature falls and cataracts, but until I passed it was not known to Europeans that this charming river among the sombre recesses of the hills took a giant leap of 200 feet into a foaming abyss, whose depth I had no means of estimating, and which the river itself had formed during bygone ages. I estimate the breadth of the river-bed at this point at about 200 yards, while from bank to bank across the face of the fall the breadth is much more. The falls of Zoa are about 25 miles inland from the mouth of the Ruu, and at an elevation of between 1400 and 1600 feet. The general outline of the fall is that of a horse-shoe. Near to the left bank is a chasm some 60 yards long by 30 yards broad and 200 feet in depth to the water-level. From the chasm to the right bank the wall is more or less terraced. Above the chasm, on the left bank there stands a huge mass of rock from behind which and down whose face during the wet season pours a gigantic cataract. At the time of my first visit the water from various channels collected into one main stream, which thundered down the chasm, foaming and tossing between its walls, sending heavenwards clouds of vapour, and in emerging from its confinement dashes itself out into a breadth of 150 yards and continues its angry course, impinging on rocks and boulders

till reaching Nakale where it composes itself into dark-blue lakelets, tempting indeed to the heated traveller. During the rainy season, while the river is full, the water is spread over the full extent of the river bed, and must indeed be a magnificent sight. The face of the falls abounds in several large and many small "pot-holes" from 18 inches to 10 feet in diameter, and from 1 to 10 feet deep. I was not fortunate enough to see the water at its work of forming these holes, but the stones lying at the bottom of them, some in the rough, others kidney-shaped and others almost round, are conclusive evidence of the water's action.

A species of algae common to many of the river-beds in Nyassa-land had taken possession of every hole and cranny where it was possible to exist, and liberally carpeted the face of the fall with living green. On the left bank several species of aloe were in bloom, and among the rocks there existed various kinds of succulent plants enjoying the moist atmosphere of the spot. Both banks are well wooded down to the water's edge.

The country around Zoa is composed of hills and ridges from the top of some of which an extensive view to the east may be obtained. The village of Nhataombere is situated on a level spot between two of these ridges that abruptly terminate at the Ruu, thus ending the series of hills which, commencing at the Murchison Cataracts, follow the course of the Shiré, gradually diverging inland to a distance of 10 miles at the Ruu, forming a wall averaging from 2000 to 3000 feet high, probably 70 miles long, and fronting the plateau on which Blantyre, Mandala, and the surrounding districts are situated. Among these hills are many hamlets of industrious Manganja, who are great workers in iron, which in the shape of agricultural implements finds a ready sale.

For eight miles beyond Nhataombere the road lies through very broken country, till reaching the Zuchila which cut up into many channels forms a river 150 to 200 yards wide at its confluence with the Ruu. The Zuchila forms the main drain for a very extensive tract of country. Rising on the north-east face of Milanji it makes a wide detour out into the plain and passes through much marshy land, collecting supplies from many streams and rivulets, some of which take their rise within a few miles of Blantyre. The country beyond the Zuchila is rather hilly for the first few miles until reaching the Milanji plain. The road from the Zuchila to Milanji ran through a succession of Wa-nyassa villages, many of which were of quite recent origin, the inhabitants having only lately crossed from the left bank. I was much pleased with the attitude displayed by these Wa-nyassa people. As we reached each hamlet we were presented by the headmen with fowls and flour. The people were delighted with the idea of having been placed under British protection, as it augured for them peace and liberty.

The Wa-nyassa, who now inhabit the country from the Zuchila along the right bank of the Ruo to its most easterly affluent in the Milanje Mountains, are the original possessors of the land. They are a peace-loving but weak people who have been harassed and carried off by the intruding Wa-yao, until now comparatively few remain in distinctly separate districts. Chipoka, recently deceased, who had his principal village on the Mloza, was the representative chief of the district. He was a quiet, well-dispositioned man, who seldom or never took the aggressive. His own hut was situated near to a clump of patriarchal monarchs of the forest, beneath whose sheltering branches, enclosed by a reed fence, are several altars raised to the ancestral spirits of the Wa-nyassa. In times of trial and difficulty the old man often found his way within the sacred enclosure, and might be seen as if in earnest, close communion with those inhabitants of the supernatural world, or making some little offering or performing acts which, if pleasing to the spirits, they would make manifest to Chipoka by assisting him in some of the many forms in keeping with the orthodox African's faith.

The whole district abounds in iron, every hamlet has its smithy, and to every group of hamlets there is a melting furnace, where the ore is reduced to malleable form. Hoes and axes were in demand, and early morning saw the blacksmith hard at work, while the hammerman, who, body bent and legs apart, raised a roughly square stone high over his head, and brought it down with herculean force upon the glowing metal, signalled to people afar off that the descendants of Ham are not wanting in the attributes of Vulcan.

A villainous Yao chief, Chikumbo, who had previously helped himself liberally to Wa-nyassa territory, set his mind on subjecting the whole tribe to his rule at Chipoka's death. His tactics, however, have been meantime defeated, and it is hoped the Wa-nyassa may be enabled to live in peace and quietness in their own homes, under the special protection of Her Majesty's Government which they so ardently craved.

The country lying along the bank of the Ruo inhabited by these Wa-nyassa is slightly undulating, and has a chequered appearance occasioned by large patches of grass land, divided by belts of moderately sized trees. The immediate banks of the Ruo support tall trees of beautiful form, whose dark green foliage, conspicuous high above the neighbouring forest, lines the course of the river. The prevailing colour of the soil of the district is red, and ferruginous. From the Shiré to Milanji sorghum forms the staple crop. I passed through fields that had produced marvellously, and I measured sorghum stalks 20 feet in length. It would notwithstanding be a mistake to suppose that such fertility is to be found all over. *Cajanus* is also cultivated extensively, and bears profusely, and here at least it almost merits the name of "bean-tree." Judging from what I saw of the Milanji plain it should

be a wheat-bearing district, and as it is only slightly undulatory, and is well watered, it would be easily brought under cultivation. It may not be too imaginary to picture this plain before long the home of many happy families in the midst of fields of golden grain.

Having reached Milanji, which can be easily done in three days from Chilomo, I was heartily welcomed by the Rev. Robert Cleland, at whose mission station I spent several days and transacted certain consular business with chiefs in the neighbourhood. This devoted missionary had purchased a piece of land for mission purposes, built a house, and started a school, and the Church of Scotland might fairly claim to have taken possession of Milanji in the name of Christianity. Chikumbo, however, proved so fickle, and maintained his aggressive attitude towards the Wa-nyassa to such an extent as to render mission work almost hopeless; the more so as Mr. Cleland had planted his station between Chikumbo and the Wa-nyassa with the double intention of appeasing the former and ameliorating the position of the latter, to whom indeed he rendered much assistance. Pending the advent of a more peaceful state of matters Mr. Cleland and his coadjutor Dr. Scott removed to a neighbouring chief under whose friendly aegis they hoped to prosecute their labours, but malarial fever had already told upon Mr. Cleland's constitution, and a few weeks after my visit he was numbered among those who have laid down their lives for the regeneration of Africa, deeply regretted by all who knew him.

Having completed what political work I had to do I moved north-east to Mount Machelamba, Mr. Cleland accompanying me. The road lay along the base of Milanji. This grand mountain merits description by a better pen than mine. Based upon a plain 2000 feet above sea-level it rises in lofty grandeur to a height of 8000 or 9000 feet and extends eastwards for a distance of 20 miles, being separated by a narrow pass from Mount Cheza, a continuation of whose well-wooded ridges extends to the south of Lake Shirwa, joining the north-easterly ledge of the Shirwa basin. The north face of Milanji, Chambe, confronts you with 6000 feet of living rock, the south and easterly faces are less perpendicular and more broken. The home of Manga is a distinct feature of this part of the mountain. Situated at the north-east corner, and slightly apart from the main body of Milanji, it rises to a height of 6000 or 7000 feet, and seems to possess an influence in attracting passing rain clouds, as the climate in its vicinity is more moist and actual showers more frequent than anywhere else.

The north-eastern face is well wooded, and in the numerous ravines which proceed from the serrated apex of the mountain may be seen the stately boles of a species of pine-tree, which, so far as I know, is still undescribed. At no remote date all the slopes of Milanji must have been densely wooded. Isolated patches of virgin forest still remain on the eastern faces; but the devastating axe and fire of the natives have

worked sad havoc. The district on the whole is well watered. Every ridge has its brook, and large streams are frequent. On the top of the mountain, within a limited area, four rivers—the Lichenya, Likubula, Zuchila, and Ruo—take their rise, the three former discharging into the latter, and all of which are formidable and difficult to cross during the rainy season. The soil is fertile, that at the north-east corner about Chipoka particularly so. All along the base of the mountains are large patches of wet grass-land, capable of producing vast supplies of rice, which at present is a limited article of cultivation. Maize and sorghum are the staple crops. Bananas grow luxuriantly. At Chipoka's there are a few orange-trees, which produce an excellent quality of fruit.

Milanji is peopled chiefly by Wa-yao and Wa-nyassa, the latter being wedged in about the upper affluents of the Ruo between Chikumbo and Metapwiri. The Wa-yao of these parts are well known as inveterate slavers, who still employ themselves in the nefarious trade.

From Milanji we passed to Mount Machemba, a long day's journey. Machemba is an unpretentious mountain, situated on the Shirwa plain, about 15 miles south-west of that lake. The Palombe river, which rises in the Cheza range and flows northwards eight miles or so west of Machemba, defines the north-western limits of the Shirwa basin, the Zuchila being the territorial boundary between the respective districts. A great part of the journey was over an uninteresting plain, monotonously level, and already badly off for water. This plain stretches northwards for many miles, and during the wet season is partly under water. During the dry season the water supply is a serious question. In the immediate neighbourhood of Machemba it is obtained from wells, and is brackish. The vegetation of the plain is mainly comprised of species of acacia, which seems to thrive anywhere. On the base of the mountain are a few baobabs, which indicated connection with the Shirwa. *Erythrina* and other genera of plants common to the lowland were also represented; while among the rocks monster euphorbias and yuccas hold possession and predominate.

The Machemba district is peopled by Anguru, who have their headquarters round the north and south-east corners of Lake Shirwa. The ruling chief is Nyeserera, who, save that his apparel was even more scant than that worn by his subjects, could not be distinguished from them. Though not distinguishable in dress, however, he proved himself a chief in kindness of heart, once he knew our mission was peaceful. He was delighted, as were all his people, to receive the British flag, and in return for some things I gave him, presented me with a fat-tailed sheep, such as I have never seen before. Nyeserera rules a numerous people, who seem to enjoy life to the full. They came in crowds to see the strangers, my friend's donkey proving a great centre of attraction.

As the territory of Nyeserera reached the limits of the Nyassa-land

Protectorate in a north-easterly direction, the object of my journey was now accomplished, and I returned to Chilomo by a route which, for a great part, lay through unexplored bush, having no particular features worthy of description.

The Sundarban: its Physical Features and Ruins.

By JOHN RUDD RAINY.

THE designation Sundarban, or Sundarbunds, as erroneously anglicised in the plural number, is bestowed upon the lower portion of the Gangetic Delta, which stretches in length about 170 miles, from the brackish waters of the wide estuary of the Húglí on the west, to the sweet waters of the still wider estuary of the Megná on the east, while it varies in width from 60 to 80 miles, from the turbid waters of the Bay of Bengal on the south to the limits of the flourishing permanently settled estates on the north. It comprises a superficial area of 7532·5 square miles, which exceeds in size the principality of Wales. This vast and excessively fertile low-lying alluvial plain may be termed the "gift of the Ganges," similarly as Lower Egypt has been termed the "gift of the Nile."

There are various derivations assigned to the name Sundarban, some of which are rather fanciful, such as Sundarban literally signifying "beautiful forest," from *sundar*, "beautiful," and *ban*, "forest"; Sundarband signifying "beautiful embankment," from *sundar*, "beautiful," and *band*, "embankment"; Sumudraban signifying "sea-side forest," from *sumudra*, "sea," and *ban*, "forest"; Sumudraband signifying "sea-side embankment," from *sumudra*, "sea," and *band*, "embankment"; Sundarbandar, the "beautiful harbour," from *sundar*, "beautiful," and *bandar*, "harbour"; but it is generally recognised, and correctly so, to be derived from "*sundri*," a well-known timber tree, so-called in the vernacular, abounding in the locality, known to botanists as *Heritiera littoralis*, and *lean* "forest." This designation is however a comparatively modern one, dating probably not farther back than the last century, for Mahommedan historians, and among them Abulfazl in his 'Akbarnamah' term this coast-line of the Bay of Bengal Bháti; which signifies "low lands overflowed with the tide;" it does not indicate that this tract was originally covered with dense forests, and when, of which there is definite evidence, the rivers on the west, as they still do on the east, carried fresh water down to the Bay, habitation and cultivation doubtless extended to the sea-board.

The Sundarban may be shortly described as a low, flat, alluvial plain, covered, where not cleared and cultivated, with impenetrable forests and jungle, and intersected from north to south with wide tidal



MAP OF THE SUNDARBAN AND ADJACENT COUNTRY.

rivers or estuaries, and from west to east with narrow tidal rivers or creeks. The main streams, during the inundation in the rainy season, have what is usually termed "double currents," that is, the surface down to a certain depth flows downward or southward, while below that depth the tide advances upward or northward. This is caused by the freshets sweeping down from a higher level and overtopping and passing above the flood tide from the sea. Even to skilful swimmers this treacherous double or under-current is most dangerous, for one falling accidentally and suddenly into a stream naturally sinks at first below the surface, when the under-current drags him in one direction, while the upper-current flowing in a contrary direction prevents his rising to the surface, and he soon gets asphyxiated or drowned, and the body is sometimes never found, as happened some years ago in the case of the late lamented Bishop Cotton, once head master of Marlborough School.

The names given by the natives to the larger rivers are rather expressive; and a few of them may be here stated. Meghná signifies "no cloud," which is significant as meaning that no one ought to venture out in it, unless there is no cloud visible in the horizon. Balishwar means "the power of God." Haringhata, or "deer-shore river," on account of the number of (wild) deer found on its banks. Mathábhánga, or "broken-head river," that is, he who braves it will come in for a broken head or some such dreadful calamity. Mutwali, or "the drunkard," from its being usually turbulent. Kabadek or Kapatáksha, "the dove-eyed river," on account of the general placidity of this stream.

Hugli is a designation given by us Britishers to the western branch of the Ganges from its passing the town of Hugli, which name is derived from a species of bulrush growing on the swampy banks of rivers, called by the natives Hoglá (*Typha elephantina*); it also gives its name to the ancient Pargána (revenue division) of Hoglá, which comprises my property, the "Khulná Estate."

Among the striking differences between the extreme eastern and western Sundarban may be noticed the height of the tide and rainfall. In the former, the tide rises, it is said, over 80 feet, while in the latter it barely exceeds 23 feet. The rainfall also varies considerably; it is said as much as from 200 to 300 inches in the former, and only 82.29 inches in the latter.

In the Sundarban, deltaic action may be seen in active progress; and such lands are continuously formed, not as some suppose merely by the annual inundation leaving deposits on the surface of the country submerged, which creates new land, but mainly by the various streams depositing the silt and sand they hold in suspension in their waters on their own beds, which gradually rise above the level of the adjacent lands. This necessarily causes the streams to change their channels

successively, for water cannot run along a raised embankment, as it were, and must seek its level, and thus new channels are created and filled up in turn, till the entire surface becomes raised, when deltaic action may be said to cease; but this last stage has not been reached as yet throughout the Sundarban.

It may be worth while mentioning, that the drainage system of alluvial formations, such as the Sundarban, differs diametrically from that of ordinary lands of a higher level. In the latter, as is well known, the water radiates from an elevated central point and flows outward; and this may be termed the centrifugal system of drainage. But in deltaic land, as in the Sundarban for example, the exact reverse is the case, as the water from the surrounding parts flows inward to a depressed central point, and this, in contradistinction to the other, may be termed the centripetal system of drainage. This is the chief cause of the unhealthiness of all deltaic lands, and sufficiently accounts for the insalubrity of the Sundarban, for such soil has a tendency to retain subsoil moisture, which is a prolific source of zymotic disease.

The soil of the Sundarban is entirely composed of alluvium, and as such there is nothing else than fluvial accumulations. But there is ample evidence to establish the fact, that the Sundarban in a comparatively remote period sank from some cause, possibly due to submarine volcanic action, below the level of the sea. This is proved by the discovery at various depths below the surface of beds of peat, stumps of trees *in situ*, bones of birds and fishes, &c.

Before proceeding to describe the ruins in the Sundarban, which attest its former flourishing condition, if not grandeur, the larger fauna and flora of that littoral region demand at least a passing notice.

The rivers in the Sundarban are infested with two closely allied species of the genus *Crocodilus*, namely, *C. porosus* et *C. palustris*, both equally destructive to man and beast venturing into the stream. These crocodiles are most daring. As an instance of it, I may relate that on one occasion, some years ago, when the prisoners of the Khulná jail were drawn up on the banks of the river to be mustered before being sent to the Presidency jail, a crocodile suddenly swept one of them with its tail into the stream and carried him away. The women of Bengal, who constantly go to draw water from the river, are the chief victims, as is testified by the fact of long human hair and bangles being found in the stomachs of these species of crocodile when ripped open. There is also another and distinct genus and species of aquatic saurian to be occasionally seen in some of the fresh-water rivers of the northern Sundarban, which are not known, in these parts at least, to make man or beast their prey, but feed almost exclusively on fish, though they will seize and devour any dead or wounded bird that may drop into the stream on being shot. This species of crocodile has a long, slender muzzle, evidently of no great strength, and is known to naturalists as *Gavialis*

gangeticus. But besides these crocodiles, which, with only one exception, make man their food whenever they can get a chance of so doing, the rivers in the Sundarban produce numerous and abundant fish, which forms food, and excellent food too, for man. Among them may be mentioned the extremely rich *Hilsá* or so-called Indian salmon, properly *Sard* (*Clupea palasah*); the well-flavoured *Bhekti* or "cock-up" (*Lates calcarifer*); the delicious eating *Tapasi* or mango fish (*Polynemus paradiseus*), and the very curious and rather savoury *Kai* or climbing perch (*Anabas scandens*), which latter is sometimes found with its dorsal fins attached to the stem of the water-loving mangrove (*Rhizophora mucronata*).

The forests and jungles in the Sundarban are equally dangerous to man and beast, for in them are to be found the much-dreaded royal Bengal tiger and the destructive leopard (*Felis tigris et Felis leopardus*), which prey on the inhabitants and their cattle, respectively, whenever they can get a chance of so doing. A great number of the natives are annually slaughtered by the former, and they are even known to break through the matted walls of the dwelling houses at night, and carry off human beings, but it is a curious fact that they never carry their victims away through that side of the house by which they entered, but break through the opposite side to do so. The largest of the *feræ naturæ* is the one-horned rhinoceros, which is identical with that of Java, *Rh. sondaicus*, and differs from the other Indian one-horned species (*Rh. indicus*) in being shorter in height, but not in length, and the female only possessing the nasal protuberance, which is not really a bony structure, but merely agglutinated hair, that is, it is similar to the horns of hollow-horned ruminants. It rarely interferes with man unless attacked, or much disturbed when feeding on the tender branches of trees, especially if a female with her young in attendance. Next in size is the fierce buffalo (*Bos bubalus*), which will not brook being disturbed, and commits great damage on the ripening crop of rice. Still more destructive to such crop is the surly wild boar (*Sus indicus*), and if attempted to be driven away from its succulent repast by a single man, will charge at once, and with its long sharp tusks leaves gaping wounds, which, if inflicted on the head, thorax, or abdomen, generally prove fatal. There are four species of deer, properly so called, that is with solid deciduous horns, abounding in the Sundarban. They are:—the big and large-antlered swamp deer (*Cervus Duvaucelli*); the graceful and fine-antlered spotted deer (*Cervus axis*); the small and short-antlered hog deer (*Cervus porcinus*); and the still more diminutive and still shorter antlered barking deer (*Cervulus aureus*); all of which afford tolerable venison.

The serpent tribe is well represented in the Sundarban, both venomous and non-venomous. Among the former are included the deadly cobra (*Naia tripudians*); the scarcely less deadly carpet viper (*Echis carinata*); and the exceedingly venomous snake-eater (*Ophiophagus bun-*

garus), which is about the largest in size of poisonous snakes, and is remarkable for subsisting on nothing else than its own kind, devouring its smaller brethren without any mercy. It may be added that, as all salt-water snakes are venomous—all fresh-water snakes being innocuous—all such found in the Sundarban may be reckoned as poisonous. Of the non-venomous snakes, I need name one only, the huge rack-snake or python, erroneously called the Indian boa constrictor (*Python molurus*), which attains great length, and is capable of swallowing an entire deer or pig.

The avi-fauna or the feathered tribe are not very numerous or important in the Sundarban, but among them may be noticed the red jungle fowl (*Gallus ferrugineus*); the larger grey or swamp partridge (*Ortigornis gularis*); Pallas's sea-eagle (*Haliaetus leucoryphus*); and the gigantic stork or adjutant (*Leptoptilus argala*), known to the natives as the *Hárgilá* or bone-swallower, on account of its ravenously swallowing its food, bone and meat together. The under-tail coverts of this last bird furnish those beautiful plumes known as "marabout feathers," but which correctly can only be obtained from the sides of the African adjutant or marabout (*Leptoptilus cruminiferus*).

The flora of the Sundarban is numerous and various, but neither of the two best Indian timber trees are to be found there, namely, the teak (*Tectonia grandis*) or *Sál* (*Shorea robusta*). The principal timber tree is the *Sundri*, which has been already noticed as giving its name to the Sundarban, and nearly all the boats plying on the rivers there and thereabouts are built of this strong wood, which is of rather close grain, but somewhat brittle, and not very durable. The other chief timber trees are the *Keorá* (*Sonneratia apetala*), which yields a soft wood of no great durability; the *Garan* (*Ceriops Roxburghianus*); the *Pasar* (*Carapa obovata*); and the *Uriya-Am* (*Mangofera oppositifolia*), which produces a close-grained and rather durable wood. The felling of trees for timber for planks and posts, and for fuel, employs a class—not caste, for they are both Hindus and Mohammedans—of professional wood-cutters, termed *baulis*, who proceed in boats to certain temporary locations in the Sundarban forests, called *sáis*, each one of which is presided over by a *fakir*, who is supposed to possess the occult power of charming away tigers, and who has undoubtedly some knowledge of woodcraft. Here the wood-cutters work six days in each week, one day in the week, but no particular day, being set apart for the worship of the local sylvan deity presiding over that particular forest, and the *fakir*, who is supposed to have some personal knowledge of this supernatural personage and his or her likes and dislikes—for such deities are not considered as confined to one sex—acts as high priest for the occasion, readily obtaining a consideration for his services in this and other respects.

There is no conservancy, properly so called, needed for preserving the Sundarban forests, but it has notwithstanding been handed over to the

Forest Department, who have charge of it, and do little more than realise the forest dues, and effectually obstruct the extension of cultivation in the Sundarban, for on any application being made to Government for the reclamation of such land, they are strenuous in their opposition to it as curtailing the area of their jurisdiction, and necessarily diminishing their profits. The transfer of the Sundarban forest from the control of the Commissioner in the Sundarban to the Forest Department appears to be altogether a retrograde policy, as it hinders the spread of cultivation in the Sundarban, which contains the finest rice-fields, not only in Bengal, but in the whole of India; and its potential granaries would be a good stand-by in cases of famine and scarcity, for they are not nearly so dependent upon rainfall for their cultivation as in other parts of Bengal.

There are numerous ruins of brick-built houses and temples, and extensive tanks scattered all over the Sundarban, which establish the fact that they were at some time or another inhabited and cultivated; but in the utter absence of all records regarding them—for no historian, Mahomedan or Hindu, has given us any information on the subject—it is well-nigh impossible to come to any definite idea regarding their importance. It is true we have some old maps of early European settlers or traders in Bengal, Portuguese and Dutch, such as that of Joao de Barros of A.D. 1540,* and Mattheus van den Broucke of A.D. 1660,† and in the former there are five towns distinctly placed within the area of the Sundarban, to wit, Tipuria, Pacakuli, Noldij, Cuipitavaz, and Dapara, but these maps have evidently not been prepared from actual surveys, so no absolute reliance can be placed on them. The places mentioned in them have been merely conjecturally identified, and inferences drawn from such material cannot be otherwise than vague and uncertain. Again, early European travellers have given us some information, and one of them, Ralph Fitch, who journeyed over this tract of country in A.D. 1586, describes it as being fertile, and the houses of the people as being very firm and lofty, doubtless to withstand the cyclones and storm-waves, which are almost of periodical occurrence in the Sundarban. But such information is not precise enough to enable us to identify the localities, hence their testimony has been characterised as unworthy of credit, although on altogether insufficient grounds.

Then, lastly, we have local traditions, which, in the absence of history, carry some weight undoubtedly, and these clearly point to the Sundarban being inhabited and cultivated at some more or less remote period. These tales are handed down from father to son, and though they no doubt become more or less exaggerated as they proceed from one generation to another, they are not devoid of substantial basis; and the times to which they refer are not so remote as for them to have

* Vide his 'Da Asia,' vol. iv, pt. 2.

† Vide François Valentyn's 'Beschryving van Choromandel,' pt. v.

altogether merged into the marvellous. Stripped of all exaggeration as to the past grandeur of what is now little more than a howling wilderness, they may be said to fairly establish the fact of its being peopled and the lands tilled and producing crops of edible grain.

Then the question naturally arises, if the Sundarban was once a flourishing colony, why is it not so *now*? This interrogatory is often put with a half-suppressed triumphant smile, as if the question could not be satisfactorily answered by those who consider that the Sundarban was always in the state of utter desolation they now find it. A clear and conclusive reply to it can, however, be given, and has been before now given. Putting aside all comparatively minor considerations, such as the incursions of pirates, Portuguese, and natives, devastations from cyclones and storm-waves, which have doubtless contributed to some extent in depopulating this tract of low-lying and exposed country, it is merely necessary to point to an acknowledged physical change to adequately account for its being abandoned and overrun with forest and jungle.

Before describing this change it is necessary to premise that, wherever there is sweet water in the rivers there the natives will be found residing on its banks, and cultivating the fields around them, while the exact reverse is the case, as a rule, where the streams contain brackish water. This will not, and in fact cannot be gainsaid, for in such parts of the Sundarban—the eastern portions—where there are fresh-water rivers, habitation and cultivation are now found to exist almost if not quite down to the sea-board.

Now the physical change, discussed at length by Dr. T. Oldham, when President of the Bengal Asiatic Society, in *Proc. As. Soc. B.*, 1870, pp. 46–51, was the shifting of the bed of the lower portion of the mighty Ganges from the west to the east, and its junction in the latter direction with the still mightier Brahmaputra. This event is estimated to have occurred a few centuries back, and it is an admitted fact that the rivers in this tract since then having no considerable bulk of fresh water poured into their upper channels, have been mainly fed by the tide coming up from the sea, which of course renders these streams more or less impregnated with brine, and quite unfit for human beings to drink.

To turn to the extreme west, we find that the Ganges formerly, at a place called Tribeni, which signifies three streams, separated into three branches, one of which only now exists as a broad navigable river right through, and is known to us as the Hugli; another, called the Saraswati, which joined the Hugli lower down; and the third, the Jabuná, which has now only a width of 100 yards or so when it enters the southern district of the Twenty-four Pargánás, and though it widens lower down, it is not from fresh water thrown into it from its source,

but merely from receiving the local drainage of the country it passes through and from the flood coming up from the sea, for it flows into the Ráimangal estuary, close to where it merges into the sea. This river flows through the centre of the Sundarban, and the ancient city of Yashohara-Ishwaripur is situated on its banks, but it no longer carries sweet water down its entire length, as it no doubt did at one time, hence there is little of habitation and cultivation along the course of this river in the Sundarban. And as with this river, narrowing from want of ample supply of fresh water at its source, so it is with other rivers, such as the Bhairab, the Kabadak, &c.

The ruins in the Sundarban now demand attention. Taking them in chronological order, it is necessary to begin with those situated close to the Government subdivision of Bagerhat, at Háveli-Khálifatábád, which dates from the beginning of the fifteenth century, or more than 400 years ago.

The most prominent and imposing of these ruins is, what is commonly called the *Satgumbaz*, but as this designation signifies "a mansion of sixty domes," whilst it has in reality no less than seventy-seven domes, the correct name ought to be, as it doubtless originally was, *Sathattargumbaz*, or "a mansion of seventy-seven domes." This edifice is of peculiar structure, and has no less than six-and-twenty arched doors on the four sides, which open into a vast hall, the dimensions of which are quoted as 140 feet in length by 96 feet in width, or having a superficial area of 13,440 square feet. This most spacious hall is, however, not very lofty, which detracts from its appearance; its many-domed roof is supported by six rows of pillars of ten pillars in each row, or sixty pillars in all, which are of grey sandstone encased in brickwork, but this less substantial addition has given way more or less everywhere, leaving the stone almost bare. The façade of the building is to the east, which has eleven doors, that is, one large central door and five small doors on each side, and on the opposite side, the west, there are also an equal number of doors of similar size and shape, which would permit of the building being used by Musalmans as a place of worship as well as business, as they would face the west on entering the building from the front, and could kneel down and pray in the supposed direction of Mecca, as they always do; and tradition says it was utilised for this double purpose. The remaining fourteen doors are equally divided on the north and south sides of the building, and on the four corners thereof there are circular towers, two of which, those facing the front or east, have spiral staircases leading to the roof. There is little of ornamentation on either the exterior or interior of this curious edifice, but there are conspicuously placed over each of the doorways five small circles, one in the centre and four round it, which are evidently significant, and apparently represent the arms of the then reigning monarch of Bengal, Mahmud Shah, the twelfth of

the so-called independent kings of Bengal, as the coins struck by this sovereign bear similar circles on them.

The ruin next deserving of notice is the mosque, the exterior of which represents a square of about 50 feet, but the interior is octagonal, with a large single domed roof, on the summit of which stands an ornamental pinnacle. Within this building is the tomb of its founder, Khán Jáhán Ali; it is a massive stone sarcophagus of six feet in length, slightly raised above the level of the floor, and literally covered with Arabic and Persian inscriptions; there are four in the former language and only one in the latter. The first Arabic inscription states that here died a slave of God who prays for His mercy, and that his name was Alagh Khán Jáhán Ali, "who left this world for a better one on the night of Wednesday, 26th Ze'l Higgah, 863 Hijra," = 24th October, 1459 A.D., and not "about the end of March or beginning of April A.D. 1458," as vaguely stated by a native chronicler, Bábu Gaur Dás Baisakh, in Jour. As. Soc. B., by Mr. James Westland in his 'Report on the District of Jessore; its antiquities, its history, and its commerce.' The floor of this building is paved with pretty encaustic tiles, which gives it a pleasing aspect.

Adjacent to this mosque is the tomb of Khán Jáhán Ali's chief servant or deputy, Muhammad Tahir, who was a high caste Brahman and became a co-religionist of his master by a curious stratagem devised by the latter to pay off an ingenious joke perpetrated by the former. The tale is rather interesting and will bear repetition.

During the fast of the Rámján, when devout Musalmans refrain from tasting any food whatever from sunrise to sunset, Khán Jáhán Ali was taking an evening promenade in his beautiful garden, well stocked with highly scented flowers, when a poor but high caste Brahman from the ancient city Vikrámpúr in the Dháká district approached him, and after a low salutation presented him with an exquisite bouquet of flowers of the exceedingly odorous *Ganda-ráj*, or "king of scents" (*Gardenia florida*).

The Khán, who had a great liking for strongly perfumed flowers, as most Mahommedans of refined taste have, naturally lifted the flowers to his nose and inhaled its sweet odour. The wily Brahman then interposed and said, his august master ought not to have done so, and that was his, the slave's misfortune, not to have been able to have prevented it, for the Khán had now irretrievably broken his fast, for "smelling was half eating," according to the Sanskrit saying, *Grahan ordhek bhojan*. The Moslem warrior saint said not a word in reply, but looked grim, and inwardly determined to effectually revenge himself upon this perfidious Hindu. Some time after he held a grand reception in his hall of audience, and the Brahman with many others was invited to attend. At the back of the building a savoury broth of beef was being prepared, which is strictly forbidden the Hindus to taste, but the closed doors in that direction effectually prevented the scent

from being wafted inside the building. When, however, the Brahman came forward to offer his obeisance to the Khán, on a pre-concerted signal the servants flung open the doors, when the overpowering odour of the soup immediately streamed in the hall, and the Brahman at once lifted a corner of his flowing chudder or muslin robe to close his nostrils, but it was too late. The Khán said he must have inhaled the odour of the forbidden meat, or he would not have attempted to close his olfactory organ, and as according to the Brahman himself, "smelling was half eating," he must be pronounced to have tasted the prohibited meat, and thereby effectually lost his caste; there was now no other alternative left for him but to become a follower of the prophet, which was after all his good fortune. Thus he became a Mahomedan, assuming the Moslem name of Muhammad Taher; and the descendants of his sons, who were born previous to his loss of caste, are reputed to belong to a family who are now the wealthiest and most honoured of the nobles of Bengal, but are nevertheless reckoned in the Hindu marriage market as tainted Brahmans, termed Pir Ali Brahmans, from their aforesaid ancestor, who is generally known as Pir Ali.

There are numerous other mosques erected by Khán Jáhán Ali and his followers, reputed to be no less than 360 in number in this locality alone, and one of them is of rather large dimensions, with a broad tank facing it, and is said to have been built by one Sádát Khán, a disciple of the warrior saint.

The ruins of a brick-built bridge remain to show that the stream which flows past this place, called the Mágrá Nadi or river, which was evidently of much larger size four or five hundred years ago, was at that time spanned by a substantial masonry bridge. On the banks of this stream is a landing-place, or rather the ruins of it, designated Pátharer-ghát, or the "stone ghát."

A description of these ruins would be incomplete without an account of the tame crocodiles in a large tank, where Khán Jáhán Ali is said to have kept two pet crocodiles who answered to their respective names, Kálá-par, or "Blackside," and Dholá-par or "Whiteside," and from whom those now there are said to be descended. Like them, too, they come on being called by the Fáqir, and are reckoned in some wise sacred. They, no doubt, come readily on being called, because generally some food, in the shape of a kid or fowl, is thrown to them, for the possession of which there is always a grand scramble, and sometimes a good fight when the opponents are well matched in point of size. They do not appear to have abundant food given to them, except at one particular time of the year, reckoned to be the anniversary of the death of Khán Jáhán Ali, though it is not so in reality, when barren Mahomedan wives from all parts flock to the spot, and offer fowls to these saurian monsters, who, on their hunger being appeased, are considered to possess alike the inclination and power of conferring on their donors

their hearts' desire of becoming mothers. What charm these crocodiles exercise over them I cannot say, but the belief is general as to their potency in this respect. Elsewhere, too, where tame crocodiles are kept, the same practice prevails, namely Panduah in the Hugli district, and at Karachi in the Bombay Presidency.

The ruins we have just described at some length, clearly indicate that Haveli-Khálifatábád must have been a place of no little importance in days gone by, and if further proof were wanting to establish this point, it is supplied by the fact that it was a mint town in 922 A.H. = 1615 A.D. A silver coin is figured in Jour. As. Soc. B., vol. xlii., pl. ix., No. 10, and the Persian inscription on the reverse relates that it was struck by "Nucrat Shah, the king, son of Hosain Shah, the king, the Husaini. May God perpetuate his kingdom and his reign. Khálifatábád, 922."

Not very far from this place, in a north-westerly direction, on the right bank of the Bhairab river, are two places named Fathipúr and Játrápúr, villages in my estate, which are supposed by my brother, Mr. H. James Rainey, to be identical with "Fattapoer" and "Sjath-rapoer," mentioned in Van den Broucke's map of Bengal of 1660 A.D.*

The ruins of Yashohara-Ishwaripúr next claim attention, and they belong to a period a century later. They are situated, as before stated, on the banks of the Jabuna river, within the Government subdivision of Satkhirá, in the district of the Twenty-four Pargánás. These buildings were erected by Hindu Rajas, who appear to have dwelt here during the reign of the Emperor Akbar, and it is necessary to relate, by way of preface, some historical facts regarding them before proceeding to describe some of the many ruins there.

Rájá Pratápádivyá was one and the chief of the *Barah Bhuyas* or twelve great landholders, who held sway over Bengal during the sixteenth century, and a history of him, where he is grandiloquently designated "King of the Sagar Island," was written by Bábu Ram Rám Bosa, one of the earliest prose works in the Bengalaí language, which, it may be added, is a comparatively modern language, dating no farther back than a few centuries. It sets forth that one Sivananda Ráy journeyed from Sátgáon, during the reign of the King Sulaiman, to seek his fortune in the royal court then held in Gaur, where he obtained honourable and lucrative employment. That on the demise of the King Sulaiman, his son Daud succeeded to the throne, but refusing to do homage to the Emperor of Dilhi, an imperial force was sent against him, and he was defeated and slain in battle. When the army of the Emperor was marching against him, he entrusted much of his wealth to two sons of Sivananda, named Vikrámadivyá and Vasanta Ráy, to carry to some place of safety. They proceeded in boats down the river, and established themselves on a spot far away southward on the banks of

* Vide his paper in Pro. As. Soc. B., 1884, pp. 19 and 20.

the Jabuna, which thence became known as Yashohara, that is, "glory depriving," signifying that Gaur had been stripped of its wealth to enrich this place. Afterwards Vikramádityá appears to have attained, or assumed the rank of Rájá, and a son was born to him in this his new habitation, who was named Pratápádityá, and of whom it was predicted at his birth by an astrological Brahman who cast his horoscope, that he would supplant his father. He was well educated and trained, became a good scholar and excelled in all manly exercises, and fulfilled the prophecy regarding him by usurping the authority of his father and obtaining, it is said from the Emperor of Dilhi, the status of Rájá, when he removed the seat of his government to Dhumghát, where he built many fine buildings. He prospered exceedingly for some time, but becoming arrogant in his ever increasing prosperity, he refused to pay tribute to the Emperor Akbar, who sent his renowned Hindu general, Rájá Man Singh (the ancestor of the present rulers of the Jaipur State) to overthrow him, as several attempts made by other and inferior generals were unsuccessful, their armies being routed and the leaders killed. Man Singh with his superior army, after a toilsome march, arrived before the city, which appears to have been fairly fortified, carried it by assault and captured the rebellious Rájá. He was imprisoned in an iron cage, and despatched to Dilhi, but died *en route* at Benares, it is said by swallowing some deadly poison concealed in a ring he wore, rather than suffer the ignominy of being paraded through the imperial city shut up like a wild beast. This episode of the march of General Man Singh and his army to subdue Rájá Pratápádityá is referred to in the opening lines of the charming Bengali poem of Bharat Chandrá Ráy, entitled *Vidyá-Sundar*.

The two capitals, old and new, of Rájá Pratápádityá's dominions, namely, Yashohara-Ishwaripúr and Dhumghát, are situated about 12 miles apart, but the remains of brick walls and moats show that they were fortified cities, capable of standing a siege of some duration against an army not possessed of artillery, if resolutely defended by the garrison.

Among the ruins the most conspicuous is the palace, known as the Bára-dwari, or the "Mansion of Twelve Doors," which was apparently a capacious and rather imposing dwelling-house; and in front of it is to be seen what was originally, no doubt, a fine piece of water, or a magnificent tank.

The next building deserving of notice is the Hafiz-Kháná, to wit, the jail, also a rather imposing brick-built structure, the roof of which, despite the neglect of centuries in a country where edifices soon fall to decay, owing to unfavourable atmospheric conditions, if not repaired periodically, remains intact; and tradition says it was originally three stories high, two of which have sunk below the surface of the ground,

but no excavation has been made to verify it. If it was merely used to confine malefactors, they must have been both numerous and daring, but it was used probably as a guard-house or arsenal as well.

Of the remaining buildings one only need be mentioned, and that is the temple dedicated to the bloody goddess Káli, of the Hindu pantheon, who bestowed her name upon the city—Ishwaripúr signifying "City of the Goddess," she being reckoned among her votaries as the goddess *par excellence*—and was considered the tutelary goddess of the place. This magnificent brick structure rises high in the air, and appears to have been subsequently converted, doubtless immediately after the overthrow of Pratápádivyá by the Mahomedan conquerors, though led by a Hindu general, into a mosque. The goddess is now worshipped by the Hindus in another and very inferior temple, where she dwells as a trunkless image, covered with much swaddling clothes to hide the defect of her lower extremities. A legend, well worth narrating, explains how the Rájá came to possess this image, and how the so-called spirit of the goddess that dwelt therein passed away from it. It runs in this wise:—

Pratápádivyá having beheld a bright light emerge from the depth of a stream, fasted and prayed for three days to discover its meaning, at the end of which it was revealed to him in a vision by the goddess Káli, who appeared before him and told him that her stone image below the water produced the resplendent rays issuing therefrom, and if he dammed the river, and emptied it of water at that part, he would find it. She also told him, if the image was placed in a fitting temple erected for its habitation, she would consent to dwell there and become the protecting goddess of his family. Of course the Rájá forthwith did as he was directed to do, and came across this trunkless stone image, for which he built a magnificent temple. It is said that, through the blessing of the goddess, he prospered exceedingly, and he became the most powerful man in the province, but continuous prosperity made him arrogant and tyrannical, and he perpetrated much cruelty. One day, on committing an act of greater cruelty than was his wont, the goddess appeared to him in the guise of his daughter, with a sad look on her face. Pratápádivyá thinking it was in reality his daughter and displeased with her for appearing in public, in great wrath commanded her to be gone. She gave him a reproachful look, disappeared, and utterly abandoned him; and the stone image in the temple, which faced the south, as such images always do, was found to have turned its face to the east; and shortly after the occurrence of this event the invasion of Man Sing followed, with its dire consequences to the boastful and cruel tyrant.

No article on the Sundarban would be complete without at least a passing allusion to its vast agricultural capabilities. The rice crop, the staple commodity of Bengal, flourishes there better than anywhere else

in British India, and if its cultivation were encouraged by the Government, instead of being in a manner interdicted by handing the Sundarban over to the Forest Department, who desire to preserve it as a forest and nothing else, it would lessen the price of this food-grain at all times by greatly increasing the supply. This would render the cost of living of the poorer classes cheaper than it is now, and prove highly beneficial. While in cases of famine in India—which calamity is unfortunately of periodical occurrence, owing to deficiency and irregularity of rainfall—the Sundarban would be an inexhaustible granary to draw supplies from, as the rice crop there does not depend so much on rain for its growth as it does in other less favoured and less fertile parts of India. This subject was brought forward prominently to the attention of the Government in an article by Mr. H. James Rainey, entitled “Famines in Bengal, and the reclamation of the Sundarban as a means of mitigating them,” published in the ‘Calcutta Review’ so far back as 1874, but no heed appears to have been given to the plan there advocated for the speedy reclamation of the Sundarban.

Note on the Kur River in Fârs, its Sources and Dams, and the Districts it irrigates.

By A. HOUTUM-SCHINDLER, F.R.G.S.

IN No. 274 of the *Teherân Iteld'* appeared a note on some recently executed repairs to the dam of the Kâmfirûz river, one of the tributaries of the Kur, the Araxes of the Ancients. The note contains some interesting information on the little-known sources of the river, gives a list of the villages in the Râmjird district, and is illustrated by an intelligible sketch-map with latitudes and Greenwich longitudes. The note is, somewhat abridged, as follows:—

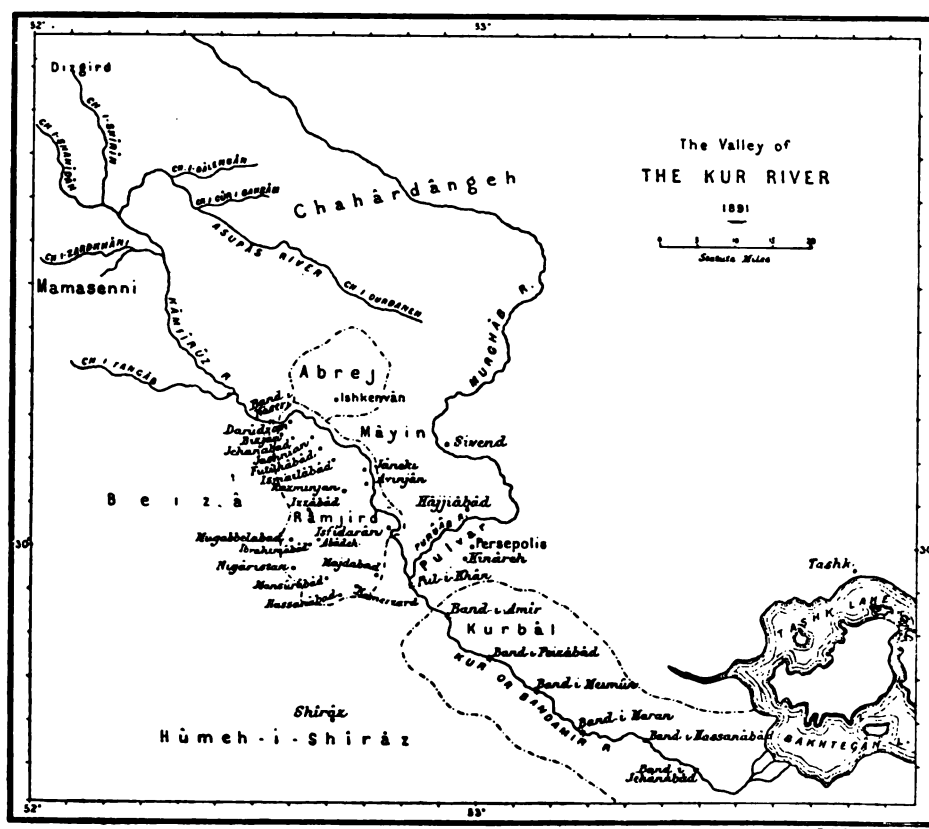
The sources of the Kâmfirûz river are the Chashmeh i Shirin and the Chashmeh i Shahîdân, in the neighbourhood of Dizgird,* and the Chashmeh i Durdaneh, the Chashmeh i Gûr i Bahrâm, and the Chashmeh i Bâlangân in the Chahârdângeh district. The three last form the Asupâs † river, and join the river formed by the two first in the Borâq Pass. After this junction the river is called the Kâmfirûz; but before entering the Kâmfirûz district it is joined from the west by the Chashmeh i Zardkhânî, rising in the Mamasenî hills, and some distance lower down, near the village Saghâd, ‡ in the Kâmfirûz district, it receives

* Dizgird is a village in the Someiram district.

† Asupâs is a village in the Chahârdângeh district, on the summer road between Shirâz and Isfahan.

‡ The Athâr i J'aferi calls this village Qal'ah i Chaghâd, and places Saghâd in the Abâdeh-Iqlid district.

the Chashmeh i Tangâb, which rises in the Beizâ district.* One farsakh lower and just before entering the Râmjird district a part of the water is led off for irrigation purposes by the Nâserî dam and the 'Aâzem canal. This dam was constructed by the Kaiânians (Achæmenides), and has been several times repaired, notably A.H. 505 (A.D. 1111-1112) by Amîr Jelâl ed din Atabeg Châûlî, under Alp Arslan, between



A.H. 590-599 (A.D. 1193-1202) by the Atabegs of Fars (the Selghuris), by the Muzafers of Fars, A.H. 1055 (A.D. 1645-1646), by Khojsh Muîn ed dîn Vazîr, and, lastly, during the past year. The dam is now called Band i Nâserî, in honour of Nâsr ed dîn Shâh, the reigning Shâh, under whose auspices the repairs were made. Before these repairs were made the inhabitants of Râmjird used to construct a temporary dam of wood-work with great trouble and at much expense; but every year their

* The old geographers place the sources of the Kur in the Kelâr district much further north.

work was swept away by the spring floods, and the canals remained empty to the end of the year, and, in consequence, Râmjird had no gardens.*

Eight farsakhs below the Band i Nâserî and at the Pul i Khân (the khan's bridge), in the Mervdasht district, the river is joined by the Purûâb river,† which rises north of the Mervdasht district, and from the Pul i Khân downwards the river is called Kur. Two farsakhs further down, at the beginning of the Kurbâl district, is the great dam of 'Azad ed dowleh Deilemî, generally known as the Band i Amîr.‡ Between this dam and the mouth of the river into the Bakhtegân lake there are five more dams viz. Band i Feizâbâd, B. i Meimûn, B. i Mavân, B. i Hassanâbâd, B. i Jehânâbâd. The Bakhtegân lake, which is the same as the Neirîz lake, is called by the people of Fars Bichegân.§ The Râmjird district has a length of eight farsakhs—from Hassanâbâd to Bizdân—and a breadth of four farsakhs—from Isfidarân to Nigârîstân. It is bounded on the east by the Mervdasht district, on the north by the Mâyîn and Abraj districts, on the west by Kâmfîrûz and Beizâ, and on the south by the

* Regarding the Râmjird dam, Ibn el Balkhî in his 'Fârsnâme', written at the beginning of the sixth century of the Hijrah, and Hamdullah Mustôfi in his 'Nuzhet ul Qulûb,' state that it was repaired by Fakhr ed dowlah Atabeg Châûlî and was therefore called Fakhrîstân. Some writers have this name as Jâvelî and Chavulî, but it should be Châûlî, meaning a falcon. Atabeg Châûlî was a Turk, and falcon, gerfalcon, peregrin, buzzard, &c., were favourite bynames of Turkish chiefs and warriors, as for instance, the two brothers Toghrul and Châkir, the founders of the Seljuq dynasty; Aq Sunqur, father of Imad ed dîn Zengi; Aq Sunqur al Bursuqî; Amîr Qarâ Sunqur under Shah Khodâbandeh Uljâitû; Tughan Shâh, the last of the Seljuqs; Tuïghun Pasha, Governor of Ofen in 1651-53 and 1657; Lala Shâhin, a general under Sultan Murad I.; Abu Şakar, &c., Toghrul, Châkir, Aq Sunqur, Qarâ Sunqur, Tughan, Tuïghun, Shâhin, all meaning some kind of falcon. Atabeg Châûlî was the third of the seven Atabegs who governed Fars for the Seljuqs from A.H. 458 (A.D. 1066), when the famous Alp Arslân took the country, till A.H. 543 (A.D. 1149), when the Selghuris came into power. The seven Governors were the Shabânkâreh Fazlevîeh, Atabeg Khamârtekin Rukn ed dowlah, Atabeg Châûlî, Atabeg Qarâjeh, Atabeg Mangubarz, Atabeg Bazabeh, and Atabeg Malik Shah. Qarâjeh made the Qarâjeh garden, north of Shiraz, where one of Fath Ali Shâh's sons, some seventy years ago, built a summer palace and called it Takht i Qajâr, the throne of the Qajârs, the reigning dynasty of Persia. If the dam was repaired by Atabeg Châûlî, of which there is no doubt, it cannot have been under Alp Arslân, for that monarch was long dead when Châûlî was Governor of Fars. The Seljuq who A.H. 505 occupied the throne was Sultân Muḥammed, a grandson of Alp Arslân.

† This river is generally known as the Pulvâr, and is the Medus of the ancients. Ibn el Balkhî writes the name Parûdâb and Purûâb; Idrisi has Farûâb.

‡ The dam constructed by Azad ed dowlah is often mentioned in Persian histories as the Sikr i Fenâ Khosrô Khurreh, sikr being Arabic for dam; the full name of Azad ed dowlah was Fenâ Khosrô Azad ed dowlah abû Shujâ'. This prince died on the 28 Shavvâl A.H. 372 (15 April A.D. 983). Below the dam the river is generally known as the Band i Amîr or Bandamîr, made famous by Moore.

§ Some travellers have affirmed that the name Bakhtegân is now not known in Fars, but in 1887 some men of the Bâserî tribe, whom I met on the Pul i Khân, knew the name well enough. The form Bichegân appears on St. John's map as that of a mountain, north of the lake.

Hûmeh of Shirâz. It produces wheat, barley, cotton, and rice, and is part of the cold region of Fars. The Governor of the district now resides at Jashniân, 14 farsakhs north of Shirâz. When the Governorship was with the family of Maḥmūd Khân Râmjirdi, the Governor's residence was at Zargerân; when it was with the family of Hâjjî Safar Khân the residence was at Abâdeh, five farsakhs south of Jashniân. The village where the Governor of this district resides is generally known as Râmjird. The villages of the district are as follows:—Abâdeh, Avinjân, Bârezâbâd, Bizdân (or Bizjân), Chamanî, *Darûdzan*, Fakhrâbâd, Futûhâbâd, Izzâbâd, Ḥassanâbâd, Ibrahimâbâd, Isfidarân, Ism'ailâbâd, *Jâneki*, Jashniân, Jehânâbâd, *Kamarzard*, Kervâzjân (or Kerâzgân), Kûshk, *Kûhek*, *Mâdehbânân*, Majdâbâd, Malikâbâd, Manşûrâbâd, Muqabbelâbâd, Naşrâbâd, Nigârîstân, Nûsenjân, Palûnek (or Fâlunek), *Qal'ah i Pul*, Qâsemâbâd, Ramjirdi, *Rasminjân*, Sahlâbâd, *Shîbkûh*, *Zakiân*, Zarâreh, Zargerân.*

Manşûrâbâd, $6\frac{1}{2}$ farsakhs from Jashniân, was founded A.H. 39 (A.D. 659–660) by Ziâd b. Obayah, Vâli of Fârs, and was then named Ziâdâbâd. When Manşûr stationed his troops there the place received its present name.†

So far the text of the Persian newspaper. The sketch-map, which I have reduced to a convenient size, shows the position of the sources of the river and of the districts and localities mentioned in the text. The western shore of the Bakhtegân lake has been corrected from the survey of Col. H. L. Wells, R.E. ('Journal R.G.S.', March 1883). The western shore of the lake and the Kurbâl district are placed on the Persian map much further west than they are on Col. Wells' map.

Of the other districts mentioned in the text I take the following from Khormûji.‡

Abraj, a small district with four villages, 12 farsakhs from Shirâz, in it is the celebrated old castle of Ishkenvân.

Beizâ, 8 farsakhs from Shirâz. The chief place is Malûsjân, with 150 houses, generally called Beizâ. It has 54 villages.§

Chahârdângeh, 22 farsakhs from Shirâz, with chief town Yezdikhâst

* This list varies from that given by J'afar Khân Khormûji in his 'Athâr i J'afari.' Khormûji leaves out the ten underlined villages and gives instead Zarqâneq, Pul i Nô, Nârek, Gôd i Zerishk, Kheirâbâd, and Dôletâbâd. Kûhek he places in Kurbâl, and Darûdzan in Abraj.

† Istakhrî says S'aidâbâd, a fortress on a high and steep hill in the Râmjird district of Fârs, was before the advent of Islam called Isqîâd. When S'aid b. Obayah b. 'Alî b. Abû Tâleb settled there the place was named S'aidâbâd. At the end of the Omâyah dynasty it fell into the hands of Manşûr ibn J'afar, Governor of Fârs, and received its present name.

‡ This name is from Khormûj, chief place of the Khormûj district, 46 farsakhs S.W. of Shirâz. The district extends from Tahûneh to Munqal, 4 farsakhs, and from the Birmî hills to the Rûd i Shûr, 2 farsakhs. It has five villages.

§ Istakhrî says the old Persian name of Beizâ was Nisâyek (some texts give Nishabeh and Sababak), and the Arabs called it Beizâ, "the white one," from its white castle,

(or Izedkhâst) on the high road between Shirâz and Isfahân. It has 14 villages.

Hûmeh of Shirâz has 72 villages. Hûmeh means the district in the immediate neighbourhood of the chief town of the province.

Kâmfirûz, a district with 19 villages, 16 farsakhs from Shirâz.

Kurbâl, a district divided into Bâlâin and Zîrin, upper and lower, with 93 villages. On St. John's map this district is wrongly called Kulvâr. Some other names wrongly written on this map are Tasht for Tashk, Khojeh Mali for Khojeh Jemâlî, Kavar for Khafr, Mahalu for Mahârlû, &c.

Mervdasht and Khafrek, the district in which Persepolis is situated, with 51 villages. Well-known villages of this district are Sivend with a telegraph station, Seidân, Qavvâmâbâd, Hâjjiâbâd where the cave with Pehlevi inscriptions, Kinâreh opposite Persepolis.

Mamasenî, also called Shûlistan, has 14 villages. The Shûl or Mamasenî tribe from which the district has its name is divided into four branches: Rustam, Bekush, Dushmanziârî and Jâvî, and numbers 5000 families.

Mâyin, 14 farsakhs from Shirâz. The principal place is Mâyin with 300 houses. It has four other villages.*

Manipur.

THE native state of Manipur in North-eastern India, which has formed the scene of the recent rebellion and massacre, consists principally of a valley embosomed in the mountainous region between Assam, Eastern Bengal, and Upper Burma. The area of the state is about 8000 square miles, while its population according to the census of 1881 was 221,070. The hill ranges encircling the valley are in the form of irregular serrated ridges, running generally north and south, and decreasing in height as they approach Chittagong and the Lushai country. The geological features of the country, so far as scattered observations admit of generalisation, do not call for special notice, though coal and iron are known to exist. It is believed that in former ages the Manipur valley consisted of a large basin which has gradually shrunk into the dimensions of the Logtak Lake. The rivers are unimportant, and eventually flow into the Chindwin river of Upper Burma. Forest trees in great variety clothe the hill

which could be seen a long way off. Hamzeh Isfahânî says that the Persian name was Diz i Safid, the white castle. Hamdullah Mustôfi derives the name from a tomb built of white stones. The Zinet el Majâlis derives it from a white hill. (There still exists a village called Tal i Beizâ, the white hill.)

* Hamdullah Mustôfi places Mâyin in Râmjird.

ranges, fir trees, teak, and bamboo jungle being found in various parts. The tea plant, which the testimony of most travellers unites in describing as indigenous to the mountainous region between China and India, grows wild in some of the hill ranges of Manipur. Among the wild animals found in the hill country are the elephant, tiger, leopard, wild cat, and bear. Several kinds of deer, the rhinoceros and wild buffalo, besides serpents of various species, also occur, though poisonous snakes are said to be rare.

The hillmen, though divided into numerous clans and sections, may be grouped generally into the two great divisions of Naga and Kuki, the former being found principally to the north and the Kukis to the south. The Naga are, however, the taller of the two. The breed of ponies is similar to that of Burma; they are generally small, under 12 hands high, but strong and hardy. The game of polo was formerly peculiar to Manipur and Ladakh—two somewhat dissimilar regions—but it has since been taken up and become a recognised pastime in India and England.

The three principal roads into Manipur are—that from Cachar eastward, which was constructed after the first Anglo-Burmese war; one from Kohima in Assam, passing through Mao; and a third, from Tammu on the frontier of Upper Burma. The telegraph line runs from Kohima, through the capital, to Tammu. Owing to the want of good roads there is not much trade, and the money revenue of the state is reckoned at from 5000*l.* to 6000*l.* annually from all sources. No tribute is paid to the British Government. The military force consists of a sort of militia, which is liable to be called out for service when required. In 1883-84 the strength amounted to about 7000 all told.

The general altitude of the valley being about 2500 feet above the sea, the climate is temperate, and at the hottest season the nights and mornings are always cool.

Dr. G. Watt, in some interesting remarks made by him on the occasion of the reading of Major MacGregor's paper on his expedition from Upper Assam into the basin of the Irawadi (see 'Proceedings' for 1887, p. 39), states that nine ranges have to be crossed by any one coming from the Cachar side, and that the same river has to be passed over more than once on account of its curiously circuitous course. In the valley of Manipur the rainfall is only about 39 inches, or the average of Great Britain, but at a distance of only 17 miles on the mountains forming the north-east ranges, the rainfall is 120 inches, and the amount is still higher to the north.

The Burma-Manipur boundary was surveyed in the winter of 1881, by Major W. F. Badgley, who passed Christmas there in company with Colonel Johnstone, the Resident, Dr. Watt, Mr. Oldham, and other British officers. Major Badgley's trip to Samjok, on the Chindwin, is well described in the appendix to the Indian Survey Report for 1881-82.

The passes between Manipur and the Kabu valley were surveyed by Lieutenant Dun of the Intelligence Department.

The demarcation had become necessary in consequence of the frequent raids and quarrels between Burma and Manipur, and the line traced by Colonel Johnstone and Major Badgley was laid down with the special object of keeping the two nationalities apart. For nearly its whole length it follows the bases of the hills or streams in deep gorges, which are parts of the country avoided by both people, the Naga tributaries of Manipur keeping high on the ridges and spurs, for their *jum* cultivation; and the Burmese keeping away from the hills in the flat plain, for their flooded fields of rice.

The following are the chief sources of information regarding Manipur:—

Captain R. Boileau Pemberton's 'Report on the Eastern Frontier of British India,' pp. 19 to 58 (Calcutta, 1835), contains a fair amount of information; while a good account of Manipur, by Major M'Culloch, who was for many years political agent there, was printed in 1859, as a volume of the Selections from the Records of the Government of India (Foreign Department, No. XXVII.).

The most complete monograph, however, on the country will be found in Dr. R. Brown's 'Statistical Account of Manipur and the Hill Territory under its Rule' (Calcutta, 1874). Dr. Brown was political agent in Manipur in 1873.

Sir A. Mackenzie's 'History of the Relations of the Government with the Hill Tribes of the North-east Frontier of Bengal' (Calcutta, 1884), contains in chapter xvi. some geographical information about Manipur; but the greater part of the chapter is taken up with a long résumé of the political events of the State since 1823, when the action taken by the British Government to restore Gumbheer Sing, one of the members of the deposed Manipur family, may be said to mark the beginning of the period of British supremacy.

The article in Sir W. Hunter's 'Imperial Gazetteer of India' is an excellent summary of existing information, though of course some notable events, such as the presentation of arms of precision to the Maharajah, and the assistance afforded by him to the British in the Burmese campaign, have happened since the publication of the Gazetteer. A continuous retrospect of the events of recent years may be obtained from the series of Assam Administration Reports.

GEOGRAPHICAL NOTES.

The Royal Medals and other awards.—The Royal Medals of the year for the encouragement of Geographical Science and Discovery have been awarded by the Council of the Society as follows:—

The **FOUNDER'S MEDAL** to **SIR JAMES HECTOR, M.D., K.C.M.G., F.R.S., &c.**, for the great services rendered by him to Geography and the allied sciences by his various papers on the physical features, geology, and climate of British North America, the result of investigations pursued under great difficulties, whilst serving as Naturalist to the Palliser Expedition of 1858. Also for the long series of admirable papers contributed by him to English and colonial journals, during his residence of upwards of a quarter of a century in New Zealand, on the geology, thermal waters, lake and fiord formations, rock basins, earthquake waves, meteorology, and volcanic phenomena of the islands.

The **PATRON'S OR VICTORIA MEDAL**, to **Dr. FRIDTJOF NANSEN**, for having been the first to cross the inland ice of Greenland, a perilous and daring achievement, entailing a journey of more than three months, thirty-seven days of which were passed at great elevations, and in the climate of an Arctic winter; obliging him to lead a forlorn hope with the knowledge that there could be no retreat, and that failure must involve the destruction of himself and his companions; and calling forth the highest qualities of an explorer. For having taken a series of astronomical and meteorological observations under circumstances of extreme difficulty and privation, during a march which required exceptional powers of strength and endurance, and mental faculties of a high order, as well as the qualities of a scientific geographer for its successful accomplishment. And for his discovery of the physical character of the interior of Greenland, as well as for other valuable scientific results of his expedition.

The **MURCHISON GRANT** has been awarded to **Mr. WILLIAM OGILVIE**, of the Canadian Surveys, for his two years' continuous explorations in the Mackenzie and Yukon regions of British North-west America, during which he made instrumental and track surveys covering a distance of 2700 miles, and gleaned much valuable information regarding the physical knowledge and products of the country. The **BACK PREMIUM** (one year) to **Mr. W. J. STEAINS**, for the carefully plotted map of the Rio Doce and its tributaries, based on upwards of 4000 magnetic bearings and careful dead reckonings, made during an adventurous exploration undertaken at his own risk and cost, which he communicated to the Society together with a paper on his journey, and which were published in the 'Proceedings' for February 1888. The **BACK PREMIUM** (one year) to **Mr. DAVID KERR CROSS**, in recognition of the value of his observations on the country and natives of the region north of Lake Nyassa, published in the 'Proceedings,' February 1891. The **CUTHBERT PEEK GRANT**, to

Lieut. B. L. SCLATER, R.E., for additional instruments to enable him to determine longitudes of positions in the explorations of Nyassaland by Mr. H. H. Johnston. The GILL MEMORIAL, to Mr. A. E. PRATT, for his two journeys in Western Sze-chuen, on the confines of Tibet, and the important additions he has made to our knowledge of the topography and zoology of that little-known region.

The three Honorary Corresponding Members chosen are M. James Jackson, Hon. Librarian to the Société de Géographie of Paris; Mr. P. B. Du Chaillu, Philadelphia; and Don Ramon Lista, of Buenos Ayres.

The Chilcat Country.—Dr. Lindeman, of Bremen, has written to complain that Mr. Seton-Karr, in his paper on "Explorations in Alaska and North-west British Columbia," published in our February No., has failed to mention that the country he travelled over at the head of the Chilcat Inlet had been previously (in 1882) explored by Dr. A. Krause and his brother, and that an admirable account of it, with a map, was published by Dr. Krause in the 'Zeitschrift der Gesellschaft für Erdkunde zu Berlin,' in 1883, p. 344. Dr. Lindeman further states that Mr. Seton-Karr's map is copied from that of Dr. Krause. A similar remonstrance, by Dr. Aurel Krause, has been published in the 'Bulletin' of the American Geographical Society, vol. xxiii. No. 1, p. 84.—Mr. Seton-Karr, on his attention being drawn to these criticisms, assures us that he had not heard of Dr. Krause's prior journey while in the country, and that he has not read or seen his paper and map in the Berlin 'Zeitschrift.' The similarity of the two maps—as regards the parts not actually explored by either traveller, for naturally the topography of the route surveyed by each would be nearly the same—is to be explained by the circumstance that Mr. Seton-Karr took as the basis of his map that published (in 1888) by Dr. G. M. Dawson, in his 'Report of an Exploration in the Yukon District and adjacent northern portion of British Columbia,' which (as far as regards the Chilcat country) was copied (as stated on the map) from Dr. Krause. On comparing the maps in the February 'Proceedings' and the Berlin 'Zeitschrift,' it will be seen that they are by no means identical, for Mr. Seton-Karr has corrected the topography in some details, such as the limits of the Chilcat Inlet, the area of the "Marble Glacier," and the direction of the Altsehk river. It is incorrect also to state that he has not mentioned Dr. Krause in his paper. He alludes to him and his map at p. 75, evidently deriving his information from Dr. Dawson's report, or rather from the note on the map accompanying the report. If the passage in the text at p. 180 had not escaped his attention, he would probably have expressed a more just opinion of his predecessor's work. Dr. Dawson says, "Dr. Arthur Krause, engaged in an expedition on behalf of the Bremen Geographical Society, in May and June 1882 made an exploration of Chilkoot and Chilcat Passes, reaching Lake Lindeman and the sources of the Tah-kheena river respec-

tively. His work is embodied in maps published by the Bremen * and Berlin Geographical Societies, and it is worthy of special note on account of its conscientious accuracy."

The Miranzai Expedition.—Captain R. A. Wahab, R.E., survey officer with the Miranzai field force of the Survey of India, reports that during the expedition an area of 95 square miles has been reconnoitred and mapped on the 1-inch scale, most of which was hitherto unsurveyed, or only mapped in part on the $\frac{1}{2}$ -inch scale. No opposition was met with by the survey party at any time from the inhabitants, and no difficulty was experienced in getting guides and any information about the country that was required. The most serious difficulties the surveyors had to contend against were due to the inclement weather. Captain Wahab has proceeded in the same capacity to join the Black Mountain expedition, and will be accompanied by Subsurveyor Abdul Ghaffar.

Discovery of a fresh-water lake near the Sea of Aral.—According to information conveyed to the Geographical Society of Paris by M. Édouard Blanc, an interesting discovery of a fresh-water lake to the south-west of the Sea of Aral has been made by Colonel Koslowski, of the Russian Geographical Service of Turkestan. Up to a comparatively recent date the Sea of Aral was represented on our maps as forming at its south-west corner a deep, narrow gulf (named Aïbu-ghir), extending far into the land, and bordering on the south-east the great Ust-Urt Plateau. The Russian military expedition to Khiva (1872-3), in its march round the south-west and south of the Sea of Aral, found no such arm of the sea, and since then the Gulf of Aïbu-ghir has practically disappeared from the maps. In the map which accompanies Baron Kaulbars' work on the delta of the Amu-daria, the so-called Gulf of Aïbu-ghir is shown merely as a depression, without water, and its form and position are only vaguely indicated. Recent surveys effected by Colonel Koslowski have revealed the existence of a fresh-water lake, occupying very nearly the position formerly assigned to the Gulf of Aïbu-ghir, but differing in its form. This lake is quite distinct from Lake Sari-Kamish, which lies to the south of the tableland of the Ust-Urt, and has recently been the subject of a special exploration by General Glukhovskoi. Unlike the Sari-Kamish depression, which, except at times of great overflows of the Oxus, is mostly dry, Lake Aïbu-ghir has a permanent supply of water, being fed by a fresh-water stream flowing into it from the north-east, which, although not in direct communication with any branch of the Amu-daria, drains the marshes formed by the overflowings of that river. The probable explanation of the formation of this lake is, according to M. Blanc, that it is part of the former great Aralian basin, which has become isolated in consequence of the general and pro-

* 'Deutsche Geographische Blätter,' V. Heft 4 (1882).

gressive desiccation which has taken place in all this region. The elimination of the salt from its waters might be due to the formation of salines, although no salt-beds under the sand round the shores of the lake have yet been discovered, or it might be supposed that at some recent epoch, during a great overflow of the Oxus, the lake basin was filled with fresh water, the salt water being driven back into the Sea of Aral, and that at the same time a bar was formed by the alluvium brought down by the river, which would prevent the salt water flowing back again into the lake. The map of Colonel Koslowski also fixes definitively the contour of the south-eastern escarpment of the Ust-Urt Plateau and the topography of the country to the south-west of the Sea of Aral.

Port of Muhamrah, Persian Gulf.—The appointment of a British Vice-Consul to Muhamrah, which took effect only a few months ago, has already borne fruit in the publication of a brief but instructive report, now printed as one of the Foreign Office "Annual Series." From its position near the mouth of the Karun river, it may be presumed that the above-named port awaits but the development of traffic routes in the interior of Persia to register, for each recurring year, a goodly account of exports and imports both. At present, for the year 1890, the exports represent a money value of 53,096*l.*, and the imports of 146,141*l.* Piece goods from India form more than three-fourths of the money value of the imports. Messrs. Lynch Brothers, of London, run a fortnightly steamer up the Karun to Ahwaz, in connection with one running thence to Shustar. A detailed statement of the traffic on this particular line is given in the report. Vice-Consul M'Donall adds that, independently of oil-seeds, flax, and roses (utilised for the noted *guláb* or rose-water), there is much wheat grown, and much more yet to be grown, on the banks of the Karun. As to local "industries," he states: "A coarse woollen cloth is made for consumption throughout the district. Dyeing and tanning are carried on in the town, and some good silverwork is done by the Sabæan community, of whom there are about thirty families." It would be well to learn something of the present state and statistics of these Sabæans, whom Mr. Ainsworth includes among the small tribes of Rayahs "engaged in the cultivation of the soil and in industrial pursuits in the towns, and who have been protected by the British authorities." Madame Dieulafoy calls them "Soubistes" and "Chrétien de Saint Jean," and has contributed somewhat new matter to the reports of older travellers on their customs and ceremonies. But her medical officer's orders prevented her intended visit to their encampment when this lady was about leaving Persia at the close of her spirited journey of 1881-82.

Proposed Danish Expedition to the East Coast of Greenland.—In continuation of the scientific explorations which have been made in No. V.—MAY 1891.]

recent years by officers of the Danish navy along the coasts of Greenland, the Danish Government is organising an important expedition to the east coast of Greenland, which is announced to start in June. The command of the expedition has been entrusted to Lieutenant Ryder, who will be accompanied by Lieutenant Wedel. The principal object of the expedition will be the exploration of the coast above the 66th parallel, in continuation of the work accomplished by Holm and Garde in 1883-5. In addition to making a survey of the coast, the movements of the inland ice will be studied.

Progress of the Marine Survey, North-west Coast of Australia.—

A report of the surveying work executed by H.M.S. *Penguin* during last year on the north-west coast of Australia, has been presented to the Government of Western Australia. The main facts are as follows:—The *Penguin* was commissioned on the 14th January, but owing to various delays did not leave England until the 17th February. After performing many minor surveying duties on the voyage, and stopping at various places on her passage out to coal, the *Penguin* arrived at Koepang in Timor on the 15th May. Here a series of observations were taken to determine the longitude of Fort Concordia, and on the 17th the ship left for Cartier Island, where she arrived on the 18th, and fixed the geographical position. On the 20th May the party left Cartier Island for Troughton Island, where they anchored on the 21st, and found the geographical position. From Troughton Island, a preliminary cruise was made throughout the length of the surveying ground, which lies between Adèle Island and Cape Londonderry. On this first cruise the latitudes and longitudes of the following salient points were determined:—Baudin Island near Cape Voltaire, Queen's Islet near Bigge Island, De Freycinet Island, South Heywood Island, and a conspicuous island near Cleft Island in the Buccaneer Archipelago. Returning to Baudin, a meridian distance was measured to the secondary meridian of Port Darwin. These two distances established Baudin Island and the points above mentioned. After a refit at Port Darwin, the triangulation was executed between Troughton Island and Queen's Islet (near Bigge Island). The Holothuria Banks were next partially surveyed. Instead of consisting, as was supposed, of a number of coral reefs awash, they were found to be composed of one large reef awash at half tide, and a very extensive bank of dead coral about 400 square miles in area, having a general depth of 12 to 16 fathoms with one or two shallow spots upon it. Some work was next performed in the neighbourhood of Cape Voltaire, Baudin Island, and Pascal Island, from whence the party sailed for Roebuck Bay, measuring a meridian distance and running a line of soundings to that port. Leaving Roebuck Bay on the 1st November, the *Penguin* proceeded to Cossack, one of the objects being to ascertain, if possible, the area of magnetic attraction which for many years has been sus-

pected to exist at some point under the sea near this port. On the 4th a series of observations were made for longitude, and the magnetic elements were obtained near Reader Head, but nothing remarkable was found either in dip, declination, or force. On the 5th the ship was swung twice three to six miles from the shore. On the first occasion there was a very slight indication of unusual variation. Leaving port on the usual track, in the afternoon, when about two miles E. by N. of Bezout Island, the ship's compasses were suddenly deflected two points to the left. The focus or point of greatest magnetic attraction proved to be a small spot not more than 50 feet in diameter, $2\cdot14$ miles N. 79° E. from the summit of Bezout Island. When drifting over it, the compass needle was first deflected 23° to the left and then 55° to the right, this large change taking place in less than half a minute. The standard compass was 69 feet above the bottom of the sea, which was composed of quartz, sand, and shells. A needle freely suspended dipped to 83° . The cause of this very powerful magnetic attraction remains a mystery. It is on the line of no magnetic variation and in one of the hottest places in the world. It yet remains to be proved if the focus is stationary. The position of Cape Cuvier, about which some doubt has existed, was determined by bearings and found to agree with the published chart. Gascoyne river was reached on the 10th November. It has been decided that the *Penguin* is to continue the survey on the north-west coast for a second year.

REPORT OF THE EVENING MEETINGS, SESSION 1890-1.

Eighth Meeting, 23rd March, 1891.—The Right Hon. Sir M. E. GRANT DUFF, G.C.S.I., &c., President, in the Chair.

PRESENTATION.—*Hew Singers Bigger, Esq.*

ELECTIONS.—*Ralph Darlington, Esq.; Frederick W. W. Howell, Esq.; H. O. Bax Ironside, Esq.; Matthias Larken, Esq., J.P.; Anthony Cornelius Meyjes, Esq.; Sir Hugh Conyngham Gaston Montgomery, Bart.*

The papers read were:—

"Travel and Ascents in the Basardjusi District, Daghestan." By G. P. Baker, Esq.

"Notes on Exploration and Photography in the Caucasus in 1890." By Douglas W. Freshfield, Esq., SEC. R.G.S.

Signor V. Sella's Caucasian Photographs (1890 Series) were exhibited, after the paper, in the Examination Hall.

Ninth Meeting, 13th April, 1891.—The Right Hon. Sir M. E. GRANT DUFF, G.C.S.I., &c., President, in the Chair.

ELECTIONS.—*William Ryland Adkins, Esq.; W. R. C. Alexander, Esq.; Charles Hannen, Esq.; Arthur Hodge, Esq.; William Bath Kemshead, Esq.; W. Lloyd Mathews, Esq., C.M.G.; General Frederick R. Maunsell, R.E., C.B.; Septimus T.*

Pruen, Esq., M.D.; H. R. Reade, Esq.; James Lyon Playfair Sanderson, Esq.; Rev. Ernest Richard Sill; Henry Dickson Struthers, Esq.; Henry Alfred Wadworth, Esq.

The paper read was:—

"Two journeys to Sze-chuen and the Tibetan frontiers of China." By A. E. Pratt, Esq.

The paper was illustrated by a series of 30 photographs of the scenery of Sze-chuen, by means of the oxy-hydrogen lantern. A large collection of views and specimens of the local art and natural history of the Tibetan borderland was exhibited after the paper, in the Examination Room.

PROCEEDINGS OF FOREIGN SOCIETIES.

Geographical Society of Paris.—January 31st, 1891: M. DE QUATREFAGES, of the Institute, President of the Society, in the Chair.—This was a special meeting, held in the large hall of the Sorbonne, for the purpose of giving a reception to Prince Henry of Orleans, M. Bonvalot, and Father Dedeken, on their return from their travels in Central Asia. A large number of distinguished men occupied the platform. M. Bonvalot read a paper on the expedition, which will be published in an early number of the "Compte rendu." The chairman, in conclusion, announced that the Commission on the Awards had decided to give the Society's gold medal to M. Bonvalot's expedition.

February 6th, 1891: Vice-Admiral VIGNES in the Chair.—

THE SOCIETY'S AWARD OF MEDALS FOR 1891.

The Chairman announced the decisions of the commission on the awards for the year. As stated above, the Society's gold medal was awarded to M. Bonvalot; a gold medal to M. Tardieu, the librarian of the Institute, for his excellent translation of Strabo; a gold medal to M. Catat, the chief of the very successful scientific mission to Madagascar, undertaken at the instance of the Minister of Public Instruction; the Erhard gold medal to M. Giffault, the cartographer; the Léon Dewez gold medal to M. Dauvergne for his important journeys to the sources of the Oxus and on the Pamir; the Alphonse de Montherot silver medal to M. Fournereau, the author of careful studies on the Khmer monuments. The La Roquette gold medal and the Jomard prize were not yet awarded.

EXPLORATION IN COSTA RICA.

A letter was read from M. H. Pittier, who stated that he had spent three months last year in exploring the banks of the river San Juan and the littoral of the Bay of Salinas. He had surveyed the barometrical profile of the line, extending from Alajuela, on the central plateau of Costa Rica, across the volcanic cordillera and along the river San Carlos, as far as the Rio San Juan. Valuable information had been collected with regard to the still unexplored parts of the northern part of Costa Rica.

NEWS FROM M. COUDREAU.

The Minister of Public Instruction communicated a letter received by him from M. Coudreau, dated 30th November, 1890, from Assissi on the river Aua, in which the traveller intimated that he had arrived at that place, after having visited the sources of the Oyapock, by a new route along the southern slope of the Tumuc-Humac and the head waters of the Maroni. He was making arrangements to ascend

the river Inini and would then explore the great central chain of Guiana which runs north and south, and finally descend the river Appruague. He had visited already nineteen Indian villages, and had compiled two new vocabularies containing nearly three thousand native words.

LAND IN THE TIAN SHAN *below* THE SEA-LEVEL.

M. Venukoff communicated a curious fact arising out of the expeditions of MM. Grijimailo and Colonel Pietzof. The former travellers found in the south of the Tian Shan a spot where the surface of the ground is *below* the level of the ocean by several hundred feet. The fact was discovered from observing that water commenced to boil only at a temperature above 212° (Fahr.). The observation of MM. Grijimailo was confirmed by Colonel Pietzof.

—— February 20th, 1891: Vice-Admiral VIGNES in the Chair.—The meeting was principally occupied with the reading of correspondence. In conclusion, M. J. Renand, hydrographical engineer, read a paper on his recent submarine explorations in the Straits of Dover.

—— March 6th, 1891: Vice-Admiral VIGNES in the Chair.—

A JOURNEY IN COSTA RICA.

A letter was read from M. H. Pittier, Head of the Physico-Geographical Institute of Costa Rica, giving an account of his journey to the southern part of the Pacific slope of Costa Rica. His route lay through country not previously explored from a scientific point of view. At a distance of several leagues from the capital, the traveller entered the region of oaks, which he hardly quitted for a whole week. The whole of the district known under the name of Candelaria, which, at the time of Ersted's visit, was well wooded and rich in interesting plants, has become denuded of vegetation through the carelessness of the inhabitants, and is to-day partly covered with a poor kind of turf, over which are scattered clumps of the fragrant bushes of the "tuate" (*Vernonia brachiata*). Beyond the Rio Tarrazu the character of the country changes, and the road ascends in a zigzag line the mountain slopes, covered with forests of virgin oaks. On the summit of the Cordillera the "Paramo del Abejónal," the vast prairie which occupies the ridge of the mountain is crossed, and then a rapid descent is made to San Marcos. From the latter place to the valley of the Rio General is a journey of five days, across the great mountain of Buena Vista, the geographical importance of which has, according to M. Pittier, been overlooked, owing to insufficient exploration. Although inferior in height to the peaks of Irazu and Turrialba, Buena Vista presents more sudden changes of climate and a greater variety of vegetation. The summits are almost continuously swept by a keen, strong wind, which condenses thick mists; sleet falls frequently, and a white frost forms when the nights are clear. The immense forests, which clothe its flanks up to a great altitude, are formed almost exclusively of oaks, among which the most frequent varieties are the *Weinmannia glabra* and the *Drymis Winteri*. The vegetation of the upper region, above the forests, is alpine in character, but bamboos were found growing beside representatives of an evidently northern flora. At one point, clearly defined formations of columnar basalt were noted; this, with other indications, led the traveller to the conclusion that the whole of the Cerro de Buena Vista is of eruptive origin; although no traces of former volcanoes were discovered. The mountain is important from a hydrographical point of view. The head waters of the Rio Reventazin occupy the greater part of its northern slope; on the west it feeds the Rios Parrita Grande, Naranjo, Savegre and Barú, while the various branches of the Rio General take their origin from its southern flank. M. Pittier intended to cross the immense forest-covered plains

extending on the left bank of the Rio General as far as the Indian villages of Terrata and Boruca, and to return to San José at the end of February. He states that the maps of all this part of Costa Rica are very faulty.

In conclusion, Lieut.-Colonel Bassot, Chief of the Geodetical section of the geographical service of the army, read a paper on French geodesy.

NEW GEOGRAPHICAL PUBLICATIONS.

(By J. SCOTT KELTIE, *Librarian R.G.S.*)

EUROPE.

Pröscholdt, [Dr.] Hermann.—Der Thüringer Wald und seine nächste Umgebung. Forschungen zur deutschen Landes- und Volkskunde . . . herausgegeben von Dr. A. Kirchhoff. Fünfter Band, Heft 6. Stuttgart, J. Engelhorn, 1891: 8vo.

Sievers, [Dr.] W.—Zur Kenntnis des Taunus. Forschungen zur deutschen Landes- und Volkskunde . . . herausgegeben von Dr. A. Kirchhoff. Fünfter Band, Heft 5. Stuttgart, J. Engelhorn, 1891: 8vo., map.

ASIA.

[Assam.]—Report on the Administration of the Province of Assam for the year 1888-89. Shillong, 1889: folio, pp. xiii., 162, and clxi., map.

Appended are a collection of statistical tables, Part I. of which deals with the physical, political, and fiscal geography of the region embraced.

[—] Progress Report of Forest Administration of the Province of Assam for 1889-90, by Gustave Mann. Shillong, 1890: folio, pp. 69, map. [Presented by the Provincial Government.]

Barkley, Henry C.—A Ride through Asia Minor and Armenia: giving a sketch of the Characters, Manners, and Customs of both the Mussulman and Christian Inhabitants. London, John Murray, 1891: 8vo., pp. x. and 350. Price 10s. 6d. [Presented by the Publisher.]

The journey here described was made as far back as the autumn of 1878, but though so old, much of it is still fresh, so little is the country known. The volume is pleasantly written. On reaching Brusa, the author went on to Angora and Kaisarieh; he then struck south by the Taurus range to the Adana region; the route then lay eastwards by Aintab and the Euphrates to Diarbekir, and thence to Trebizond. A map and an index would have added to the value of the work.

[Bombay Observations.]—Magnetical and Meteorological Observations made at the Government Observatory, Bombay, in the years 1888 and 1889, under the direction of Charles Chambers and Frederick Chambers, together with Appendices containing Accounts of Magnetic Researches. Bombay, 1890: 4to., diagrams.

[Burma.]—Report on the Administration of British Burma during 1882-83. Rangoon, 1883: folio, pp. 157 and clxxxii.

Includes chapters dealing with the physical and political geography of the province, its history under British rule, the various tribes which constitute the indigenous population, and other subjects of interest.

[**Burma.**—Report on the Administration of Upper Burma for the year 1886. Rangoon, 1887: folio, pp. 27.

[—] Note on the Progress made in the Settlement of Upper Burma from April 1887 to August 1889. Folio, pp. 12.

[—] Report on the Administration of Burma during 1888-89. Rangoon, 1889: folio, pp. 24, 100, and ccxxi. Contains a geographical section.

[—] Report on the Frontier Affairs of Burma in 1889-90. Folio, pp. 13. Contains three maps.

[**India.**—Account of the Operations of the Great Trigonometrical Survey of India. Vol. XI. Astronomical Observations for Latitude made during the period 1805 to 1885, with a general description of the Operations and Final Results. Prepared under the directions of Lieut.-Col. G. Strahan, R.E., Deputy Surveyor-General, Trigonometrical Branch. Published under the orders of Colonel H. R. Thuillier, R.E., Surveyor-General of India. Dehra Dun, 1890: 4to., pp. xiii. and 1056, chart and plates.

— Ditto. Vol. XII. General Description of the Principal Triangulation of the Southern Trigon, including the Simultaneous Reduction, and the details of two of the component series, the Great Arc Meridional Sec. 8° to 18°, and the Bombay Longitudinal. Dehra Dun, 1890: 4to., chart and plates.

— Ditto. Vol. XIII. Details of the Principal Triangulation of five of the component series of the Southern Trigon, including the following series; the South Konkan Coast, the Mangalore Meridional, the Madras Meridional and Coast, the South-east Coast, the Madras Longitudinal. Dehra Dun, 1890: 4to., chart and plates. [Presented by the Secretary of State for India.]

[**India, Central Provinces.**—Report on the Administration of the Central Provinces for the year 1888-89. By A. Mackenzie. Nagpur, 1889: folio, pp. iii., xv., and 100, map.

Includes a section on the physical and political geography, &c., of the country embraced.

[**India, N.-W. Provinces and Oudh.**—Report on the Administration of the N.-W. Provinces and Oudh for the year ending 31st March, 1889. Allahabad, 1890: folio, pp. iii., xxxvi., 173, iv., 182, and 11a.

Part I., chapter i., consists of a brief sketch of the Meteorology of the North-Western Provinces, Oudh, and Eastern Rájputána, for the year 1888. Part II., chapter i., deals with the physical and political geography of the region.

[**Madras Presidency.**—Report on the Administration of the Madras Presidency, during the year 1888-89. Madras, 1889: folio, pp. xvi., 211, and clxxix., maps and diagrams. [Presented by the Government of the Presidency.]

A collection of statistical tables is given in the Appendix, a section of which is devoted to the physical and political geography of the Madras Presidency.

[**Punjab.**—Report on the Administration of the Punjab and its Dependencies for 1882-83; 1888-89; 1889-90. Lahore, 1884-1890, folio. [Presented by the Punjab Government.]

In the report for 1882-83 the sections relating to the physical features of the Punjab, its area, climate, and chief staples, its political history, its tribes and languages, are written at some length.

The two other reports also contain sections devoted to the physical and political geography of the country, and each report contains a map.

[**Shan States.**—Report on the Shan States, 1887-88. Rangoon, February 1889: folio, pp. 53 and ix.

The Appendices contain, among other things, a Note on the Spelling of Shan Names.

[—] Report on the Administration of the Shan States for the year 1888-89, Rangoon, September 1889: folio, pp. 18 and xi., map.

[—] Report on the Northern Shan States, by Lieut. H. Daly. August 1888 (pp. 41 and viii.); Ditto, November 1889 (pp. 25 and xii.); Ditto, July 1890 (pp. 12 and x.). Rangoon, folio.

These Reports, although mainly political, include incidental notes on the geography of the country. A map accompanies each Report.

[—] Report on the Southern Shan States, by A. H. Hildebrand, Superintendent, Shan States. Rangoon, December 1887: folio, pp. 25 and xvi.

Mainly of political interest.

[The above Reports are presented by the Governments of the various provinces.]

AFRICA.

Andrada, J. [C.] Paiva de.—Manica: being a Report addressed to the Minister of the Marine and the Colonies of Portugal. London, G. Philip & Son, 1891: 12mo., pp. 63. Price 1s. [Presented by the Publisher.]

Colonel Andrada here gives his version of the Manica incident, and endeavours to show that the Portuguese were not the actual aggressors nor in any way to blame. The report is accompanied by a map by Mr. E. G. Ravenstein, which shows with great precision the limits of the plateau.

AMERICA.

[**America, United States.**—Department of the Interior, United States Geological Survey, J. W. Powell Director. Mineral Resources of the United States. Calendar Year, 1888. David T. Day. Washington, Government Printing Office, 1890: 8vo., pp. 652. [Presented by the Director.]

[—] Department of the Interior, United States Geological Survey, J. W. Powell Director. Bulletin of the United States Geological Survey. No. 58. Washington, Government Printing Office, 1890: 8vo. [Presented by the Survey.]

Consists of an important paper on the Glacial Boundary in Western Pennsylvania, Ohio, Kentucky, Indiana, and Illinois, by George Frederick Wright, with an introduction by Thomas Chrowder Chamberlin, illustrated with maps, sections, &c.

Brinton, Daniel G.—The American Race: a Linguistic Classification and Ethnographic Description of the Native Tribes of North and South America. New York, N. D. C. Hodges, 1891: 8vo., pp. 392. [Presented by the Author.]

Dr. Brinton believes this to be the first attempt at a systematic classification of the whole American race on the basis of language. He divides his subject into five groups, as follows:—I. The North Atlantic Group; II. The North Pacific Group; III. The Central Group; IV. The South Pacific Group; V. The South Atlantic Group. Each of these groups is in turn considered, and descriptions given of the several stocks included in them, special attention being paid to those portions of the Continent whose ethnography is little known. Dr. Brinton is of opinion that the ancestors of the aborigines of America came from no other quarter than Western Europe, and that by means of a land-bridge, which, according to certain English geologists, existed at a very early geological epoch.

Brown, Alexander.—The Genesis of the United States. A Narrative of the Movement in England, 1605-1616, which resulted in the Plantation of North

America by Englishmen, disclosing the contest between England and Spain for the possession of the soil now occupied by the United States of America; set forth through a series of Historical Manuscripts now first printed, together with a reissue of rare contemporaneous tracts, accompanied by Biographical Memoranda, Notes, and Brief Biographies, collected, arranged, and edited by Alexander Brown. 2 vols. London, W. Heinemann, 1890: large 8vo., pp. xxxviii. and 1157. Price 73s. 6d.

The author here endeavours to give as complete an idea (narrative, evidence, biography, and illustration), as is now possible, of the movement (1605-1616), *in England*, which resulted in the plantation of North America by Englishmen. The method adopted is as follows:—First is given an introductory sketch of what had been done by Englishmen in the way of discovery and colonisation prior to 1606. Then, locating the narrative in London (because that city was the chief basis of operations), the author aims to enable the reader to see the events as they developed at that time, by presenting the evidence (the letters, broadsides, &c.) in the course of the narrative as nearly as possible in the same order of time that it was presented to those then interested in the enterprise. Brief biographies of persons connected with the founding of Virginia occupy about half of the second volume, and will be of special value to the student. The work is fully illustrated with portraits, maps, plans, &c., and contains a good index.

[**Fernando de Noronha.**—The Natural History of the Island of Fernando de Noronha, based on the collections made by the British Museum Expedition in 1887, from the Journal of the Linnean Society, 1890: 8vo. [Presented by the Members of the Expedition.]

Includes a general account of the Fernando de Noronha group. A map is given, besides a number of photographic views of scenery, &c.

[**Greswell, [Rev.] W. P.**—Geography of the Dominion of Canada and Newfoundland. Oxford, Clarendon Press, 1891. 12mo., pp. 12 and 154. Price 6s. [Presented by the Publishers.]

This volume is intended to be supplementary to the author's 'History of the Dominion of Canada,' recently published. It has been compiled, it is stated, from the latest and most trustworthy maps and statistics. Scattered throughout the text will be found notes on the ocean currents, winds, rainfall, atmosphere, climate, soils, and general physical conditions of the country. The first chapter consists of a brief and prefatory account of some of the more striking features of the land. In the following chapters a geographical description is given of each of the Provinces of the Dominion, and Newfoundland. In the last chapter a few remarks are offered on the industries, wealth, and social progress of the country. The Appendices consist of a series of extracts from various sources, mainly on geographical subjects. There are ten maps illustrating the volume.

[**Lake Bonneville.**—Department of the Interior, United States Geological Survey, J. W. Powell Director. Monographs of the United States Geological Survey. Vol. I. Lake Bonneville, by Grove Karl Gilbert. Washington, Government Printing Office, 1890: 4to., pp. xx. and 438.

The present work is an important study in physical geography. It deals with the later physical history of the Great Basin, and of Lake Bonneville in particular. The Great Basin is the largest of the interior drainage areas of the North American continent. It is not, as its name might suggest, a single cup-shaped depression gathering its waters at a common centre, but a broad area of varied surface, divided into a large number of independent drainage districts. It is near the western margin of the continent, and is embraced by rivers tributary to the Pacific Ocean. On the north it is bounded by the drainage basin of the Columbia, on the east by that of the Colorado of the West, and on the west by the basins of the San Joaquin, the Sacramento, and numerous

minor streams. The extreme length of the area, in a direction somewhat west of north and east of south, is about 800 miles, the extreme breadth from east to west, in lat. $40^{\circ} 30'$, is 572 miles, and the total area is approximately 210,000 square miles. The region is occupied by a number of mountain ridges, trending, in general, in a northerly direction, inclining eastward in the northern part of the basin, and westward at the south. Between the ranges are smooth valleys. In general they are trough-like, but in places they assume the character of plains. Where the basin is broadest, the general elevation of its lowlands is about 5000 feet. The climate of the region is essentially dry. On the lowlands of the Great Basin the rainfall is but 7 inches. The average precipitation for the whole district is 10 inches. As to vegetation, a line of cottonwoods marks the course of each living stream, otherwise the lowlands are treeless. Except on the high plateaus in central Utah, there is little that may be called forest. The characteristic covering of the lowlands is a sparse growth of low bushes, between which the earth is bare, excepting scattered tufts of grass. The causes of this arid climate lie in the general circulation of the atmosphere, in the currents of the Pacific Ocean, and in the configuration of the land.

The catchment basin of Lake Bonneville comprises that part of the Great Basin lying east of the Gosiute, Snake, and Piñon mountains of eastern Nevada—an oblong area embracing about five degrees of latitude and three of longitude, and containing about 54,000 square miles, or the fourth part of the area of the Great Basin. The Bonneville Basin originated by distortion of the earth's crust, and came into existence long before the Bonneville epoch. Little is known of its earliest climatic and physical conditions, but it was comparatively dry for a long period immediately preceding the formation of the great lake. There followed two epochs of high water, with an interval during which the basin was nearly or quite empty. The first of these epochs was at least five times as long as the second. The second scored its water-mark 90 feet higher than the first, and would have encroached still farther on the basin sides had it not been checked by outflow. During the epoch of outflow, the discharging current eroded the rim, and thus lowered the lake 375 feet; and after the outflow had ceased, the water fell by desiccation, with one notable interruption, to its present level in Great Salt Lake. The final drying of the basin divided it into ten or twelve independent interior basins. Two of these now contain lakes, the others for the most part contain playas, or playa lakes with beds of salt. Since 1845, the date of the first record, Great Salt Lake has repeatedly risen and fallen through a range of 10 feet. The history of Lake Bonneville is paralleled by that of Lake Lahontan, and each is connected with a history of glaciation in adjacent mountains. This connection, the depauperation of the fossil shells, and an analysis of the climatic conditions of glaciation, lead to the conclusion that the lacustrine epochs were epochs of relative cold.

The volume is divided as follows:—Chapter i., Introduction, including a sketch of Interior Basins, the Great Basin, and the Bonneville Basin. Chapter ii. deals with the topographic features of lake shores, under the headings of wave work; the distribution of wave-wrought shore features; stream work; ice work; submergence and emergence; ridges, &c. Chapter iii., with the shores of Lake Bonneville. Chapter iv., the outlet. Chapter v., the Bonneville beds. Chapter vi., the history of the Bonneville Basin. Chapter vii., Lake Bonneville and volcanic eruption. Chapter viii., Lake Bonneville and diastrophism. Chapter ix., the age of the *Equus* fauna. The appendices contain, among other things—altitudes and their determination, by Albert L. Webster; and a dissertation on the elevation of the surface of the Bonneville Basin by expansion due to change of climate, by R. S. Woodward.

The subject is accompanied by many minutely worked out maps, and magnificent illustrations.

Powell, J. W.—Sixth Annual Report of the Bureau of Ethnology to the Secretary of the Smithsonian Institution, 1884-85. Washington, Government Printing Office, 1888: 4to., pp. lviii. and 675. [Presented by the Smithsonian Institution.]

This volume opens with the usual report of the Director of the United States Bureau of Ethnology, Mr. J. W. Powell, followed by a number of

important contributions to ethnography and kindred subjects, by specialists in each particular subject. Mr. W. H. Holmes leads with two papers—one on the ancient art of the province of Chiriqui, Colombia, and another on a study of the textile art in its relation to the development of form and ornament; these are followed by aids to the study of the Maya Codices, by Cyrus Thomas, and Osage traditions, by Rev. J. Owen Dorsey. The most important paper, from a geographical point of view, is by Dr. Franz Boas, on the Central Eskimo. For the purpose of personal exploration and examination, the author spent a considerable time in the region of which he treats. His course of travel was to Cumberland Sound and Davis Strait. The Central Eskimo, one of the great groups into which that people is divided, live in the north-eastern part of the continent, and on the eastern islands of the Arctic-American Archipelago. In Smith Sound they inhabit the most northern countries visited by man and their remains are even found at its northern outlet. The southern and western boundaries of this district are the countries about Fort Churchill, the middle part of Back River, and the coast west of Adelaide Peninsula. Dr. Boas gives an account of the topography of the region, and of the distribution, tribal divisions, and numbers of the inhabitants. He also gives minute details regarding their habits and customs. Their peculiar and ingenious weapons, implements, and utensils are fully described and illustrated. His account of their religious practices and beliefs, supplemented by translations of their myths and legends, is equally instructive. In connection with his observations made through original research, Dr. Boas presents the result of a close study and analysis of the work of former explorers in this field, by which his own contribution will command additional attention.

The report is fully illustrated, and contains a map of the province of Chiriqui, Panama, a map showing in detail the geographical divisions of territory occupied by the Eskimo tribes of North-east America, and a map of the territory occupied by the Eskimo tribes of North America, showing the boundaries.

Powell, J. W.—Ninth Annual Report of the United States Geological Survey to the Secretary of the Interior, 1887-88. Washington, Government Printing Office, 1889: 4to, pp. xiii. and 717.

This volume contains the usual Report of the Director, followed by the Administrative Reports by the heads of divisions. Of the accompanying papers the most important from a geographical standpoint is that on the geology and physiography of a portion of north-western Colorado and adjacent parts of Utah and Wyoming, by Charles A. White. This district lies within that great elevated portion of the continent which Powell and Gilbert have called the Plateau Province. No part of this district, except a small area adjacent to Green River at the south side of the Uinta Mountains, is less than 5000 feet above the level of the sea, and a large part of the uneven surface besides the mountainous portion has still greater elevation. The foot-hills of the Park Range, which is a western portion of the great Rocky Mountain system, lie along the eastern side of the district. Upon its northern border lies the broad region of open country known as Green River basin; the eastern end of the Uinta Mountain range occupies the western portion, and White River Valley lies along its southern border. The principal drainage of the district is effected by Green River (the principal tributary of the Colorado of the west), its tributaries White and Yampa rivers, and by Snake river, a tributary of the latter. This district is a part of the great arid region of the continent, and therefore, the lowland tributaries of the rivers are mostly dry during the summer. In consequence also of the general aridity of the region during a large part of the year vegetation is sparse upon the lower plain and hilly lands, which are always the drier. Other important features of this district are its cañons. These include the Uinta Cañons of Green River, Yampa Mountain Cañon, Junction Mountain Cañon, and Yampa Cañon. There is the usual abundance of illustrations, besides maps.

Shiple, John B., and Marie A.—The English Rediscovery and Colonisation of America. London, E. Stock. 12mo., pp. xvi. and 151. Price 4s. 6d. [Presented by the Publisher.]

Mrs. Shipley (better known as Miss Brown) here claims for Leif Erikson and the Norsemen the honour of being the first discoverers of America, and attempts to show that in no way does Columbus deserve the honour he has received. Her views are so well known that they need no discussion here.

[**Smithsonian Institution.**—Annual Report of the Board of Regents of the Smithsonian Institution, showing the Operations, Expenditures, and Condition of the Institution, to July 1888. Washington, Government Printing Office, 1890: 8vo., pp. xli. and 839. [Presented by the Smithsonian Institution.]

The following papers, among others, appear in the General Appendix:—
 “Were the Osages Mound Builders?” by J. F. Snyder; “Determination of the Mean Density of the Earth by means of a Pendulum principle,” by J. Wilsing and “Amerriques, Amerigho Vespucci, and America,” by Jules Marcon.

GENERAL.

Stevens, C. Ellis.—The City, a Study with practical bearings. Second edition. New York, J. J. Little & Co.: 8vo., pp. 13. [Presented by the Author.]

Wislicenus, Dr. Walter F.—Handbuch der geographischen Ortsbestimmungen auf Reisen, zum Gebrauch für Geographen und Forschungsreisende. Leipzig, Wilhelm Engelmann, 1891.

Those who are familiar with mathematical formulæ will find Dr. Wislicenus' book extremely useful in all matters having reference to fixing positions by astronomical observations, with such instruments as are usually carried on an exploring expedition. It is, however, to be feared that much that it contains will be utterly incomprehensible to the average traveller, and it would have had a far wider sphere of practical utility if the examples had been given as computed by logarithms.—[J. C.]

The following works have also been added to the Library:—

Bacon, Thomas.—First Impressions and Studies from Nature in Hindostan; embracing an outline of the Voyage to Calcutta, and Five Years' Residence in Bengal and the Doab, from MDCCCXXXI. to MDCCCXXXVI. 2 vols. London, W. H. Allen & Co., 1837: 8vo., pp. (vol. i.) xix. and 406; (vol. ii.) xiv. and 436, plates.

Bartolomeo, Fra Paolo da San.—A Voyage to the East Indies: containing an Account of the Manners, Customs, &c., of the Natives, with a Geographical Description of the Country. With notes and illustrations by John Reinhold Forster, LL.D. Translated from the German by William Johnston. London, 1800: 8vo., pp. xii. and 478.

Campbell, Donald.—A Journey Overland to India, partly by a Route never gone before by any European. London, 1795: 4to., pp. xvii., 176, 138, 181, and 9.

Dalrymple, —.—Oriental Repertory. Vol. i. Published in four numbers, from April, 1791, to January, 1793.—Vol. ii. Published in five numbers, concluded in 1808. London (vol. i.) 1793; (vol. ii.) 1808: 4to., pp. (vol. i.) 578; (vol. ii.) 600, maps, &c.

Grosier [Abbé].—A General Description of China, &c., &c. Translated from the French. 2 vols. London, 1788: 8vo., pp. (vol. i.) xvi. and 582; (vol. ii.) viii. and 524, map and plates.

Guillain, —.—Documents sur l'Histoire, la Géographie et le Commerce de la partie occidentale de Madagascar. Paris, Imp. Royale, 1845: 8vo., pp. 376, maps.

—— Voyage à la Côte Orientale d'Afrique exécuté pendant les années 1846, 1847 et 1848, par le Brick le Duconédic. Atlas. Paris, Arthus Bertrand: large folio.

- Haafner, J.**—Travels on Foot through the Island of Ceylon. Translated from the Dutch. London, 1821: 8vo., pp. 118, illustrations.
- Lisiansky, Urey.**—A Voyage round the World in the Years 1803, 4, 5, and 6; performed by order of His Imperial Majesty Alexander the First, Emperor of Russia, in the ship *Neva*. London, 1814: 4to., pp. xxi. and 308, maps and plates.
- Pagès, — de.**—Voyages autour du Monde, et vers les deux Pôles par terre et par mer, pendant les années 1767, 1768, 1769, 1770, 1771, 1773, 1774 et 1776. 2 vols. Paris, 1782: 8vo., pp. (vol. i.) 432; (vol. ii.) 272, maps.
- Parkinson, Sydney.**—A Journal of a Voyage to the South Seas, in His Majesty's Ship, the *Endeavour*. London, 1773: 4to., pp. xiii. and 212, maps and plates.

NEW MAPS.

(By J. COLES, *Map Curator*, R.G.S.)

THE WORLD.

Bartholomew, J.—Commercial Chart of the World on Mercator's Projection. Equatorial Scale, 54° to an inch. Published by G. Philip and Son, London and Liverpool, 1891. On rollers, varnished. Price 1*l.* 1*s.* 6*d.*

This is an excellent map, well suited for use in the library or office. All means of communication by rail, steamer, or telegraph are laid down, and the time occupied on the voyage by the mail steamers between the principal ports is given. Ocean currents, winds, soundings, the limits of drift ice, &c., are clearly shown, in addition to which numerous insets of countries and places of importance are given. The original edition of this map was favourably noticed in the 'Proceedings' of June 1881, and in the present instance the corrections which geographical discoveries and political changes during the past ten years have rendered necessary, have been carefully made, while in other respects the map has been improved.

EUROPE.

Balkan-Länder.—Karte der ——. Von C. Vogel. Scale 1:1,500,000 or 20·4 geographical miles to an inch. 4 sheets. Gotha, Justus Perthes. Price 6*s.* (*Dulau.*)

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AFRICA.

Afrika.—General-Karte von —, von F. Handtke. Scale 1:14,500,000 or 198·6 geographical miles to an inch. 60th edition. Glogau, Flemming. Price 1s. (Dulau.)

Bartholomew, J. G., F.R.G.S.—Map of Central and South Africa. Scale 1:5,600,000 or 76·7 geographical miles to an inch. Edinburgh, J. Bartholomew & Co. 1891. Price 2s.

This is a very useful map for reference in all questions relating to the political situation in central and south Africa, the boundaries of the respective possessions and Spheres of Influence of European powers having been carefully brought up to date. In addition to the principal map, six insets are given, one of which exhibits England drawn on the same scale as Africa, the others contain plans of the country round Cape Town, Port Elizabeth, Lorenzo Marques, Port Natal, and the mouths of the Zambezi River. It would have been well to have mentioned in what scale of measurement the soundings on these insets are given (fathoms or feet) as on that point the entire value of each port from a commercial point of view depends, and indiscriminate use of these two factors can only lead to confusion. It should at least have been mentioned where feet are indicated, as otherwise it would appear that there were 15 fathoms of water on the bar at Port Natal, whereas in fact there are only 2½, which renders the bar impassable for large ocean steamers.

The map is very well drawn and the lettering exceedingly clear.

Eritrea.—Carta della Colonia —, coll' Abissinia e colle regione limitrofe fra il Nilo, Suakim e il golfo di Aden. Scale 1:4,000,000 or 55·5 geographical miles to an inch. Guido Cora. Torino. Price 1s. (Dulau.)

Nil-Länder.—Karte der —, vom Äquator bis zum Mittelmeer. Ägypten, ägyptische Sudan, Abessinien und Emin Pascha-Gebiet, mit Plänen von Massaua und Umgegend. Glogau, Flemming. Price 1s. (Dulau.)

AMERICA.

Andes.—Dr. Alfred Hettner's Reisen in den Anden von Peru und Bolivien. Scale 1:5,000,000 or 66·6 geographical miles to an inch. Gesellschaft für Erdkunde zu Berlin, Sitzung vom 6 Dezember 1890. (Dulau.)

NEW ZEALAND.

Cook, Mount.—Map of the Eastern Slope of —, the Southern Alps, New Zealand. Scale 1:310,000 or 4·3 geographical miles to an inch. Compiled and drawn by T. M. Grant. December, 1890. S. Percy Smith, Surveyor General, N.Z.

The ascent of Mount Cook by the Rev. W. S. Green in 1882, attracted a good deal of attention to this picturesque district, and has invested it with an interest which it did not previously possess outside the colony, so much so that the number of visitors from abroad is annually increasing. Under these circumstances a handy map, such as the present, cannot fail to be of service to tourists.

ATLASES.

Bartholomew, J. G., F.R.G.S.—The School Hand Atlas. A series of fifty-four maps, illustrating physical, political, commercial, and classical geography. By J. G. Bartholomew, F.R.G.S. London, T. Nelson & Sons. Price 2s. 6d.

This atlas contains in all fifty-four sheets of well-executed maps. The first five are occupied by astronomical diagrams and physical maps. Sheets 6 and 7 contain a commercial map of the world, on which the extent of the British Empire is shown in red. As regards Africa, the shade of pink which extends across the Soudan requires some explanation, as it might otherwise lead the student to believe that all the area so coloured was under British influence, beside which, the colouring is inconsistent with that of the general map of Africa given on sheet 34. From sheet 8 to 51 the maps given are political, except in the case of continents and the British Isles, when the political map is accompanied by one orographically coloured. There is also a special map of the British Isles, showing the railways. The three concluding maps are classical, showing the Roman Empire with inset of the Persian Empire, Ancient Greece with inset of the Grecian Empire, and Italia with an inset plan of Rome. The atlas is furnished with a good general index containing the names and positions of all the principal places.

Although evident pains have been taken in the compilation, there are some errors which need correction, as, for example, on sheet 33, in the section across the Central Lakes and Nile Basin, given at the bottom of the map, the scales, both as regards altitude and distance, are altogether inaccurate, and, generally speaking, the manner in which the sections are drawn is confusing, and needs some explanation. It is, however, a question whether the sections, with their immensely exaggerated altitude scales, do not do more harm than good, by conveying to the mind of the student very erroneous ideas of the physical features of the country they are intended to represent.

In other respects this is an excellent atlas, and is drawn in a far superior style to that usually employed in the production of the cheaper class of atlases.

Schweiz.—Topographischer Atlas der —, im Masstab der Original-Aufnahmen nach dem Bundesgesetze vom 18 Dezember 1868 durch das eidg. topogr. Bureau gemäss den Direktionen von Oberst Siegfried veröffentlicht. XXXVI. Lieferung. Scale 1:25,000 or 2·9 inches to a geographical mile. Sheets:—182. Altishofen; 184. Willisau; 198. Hergiswil; 258. Sattel; 304. Echallens; 306. Cheseaux; 311. Villars; 325. St. Aubin; 341. Chatonnaye; 342. Lucens; 440. Cully; 454. Oron. XXXVII. Lieferung. Sheets:—200. Menzberg; 204. Malers; 205. Luzern; 286. Grandson; 340. Combremont; 343. Romont; 356. Moudon; 558. Rue; 458. Grandvillard; 460. Montbovon; 465. Montreux; 475. Aigle. Price 12s. each part (containing 12 maps). (*Dulau.*)

Stieler's Hand-Atlas.—Neue Lieferungs-Ausgabe von —. 95 Karten in Kupferdruck und Handkolorit, herausgegeben von Prof. Dr. Herm. Berghaus, Carl Vogel und Herm. Habenicht. Erscheint in 32 Lieferungen (jede mit 3 Karten, die letzte mit 2 Karten und Titel). Neunundzwanzigste (29.) Lieferung. Inhalt: No. 1. Der nördliche Sternhimmel. No. 5. Weltkarte in Mercator's Projektion

von H. Berghaus. No. 17. Österreich-Ungarn, Übersicht in 1:3,700,000 von C. Vogel. Gotha, Justus Perthes, 1891. Price 1s. 6d. each part. (*Dulau.*)

Sheet No. 1 is a star map of the northern heavens, on which the figures representing the different constellations are engraved. This is a system which has been abandoned in all high-class modern celestial atlases, and which only renders the map indistinct and confusing to the student, as the constellations bear no resemblance whatever to the figures drawn. Sheet 5 is a political map of the world on Mercator's projection, on which a very clear explanation of the system of colouring is given. It also contains (on insets) a wind chart of the world, a telegraph chart, which, however, shows only a few of the lines of communication, and a current chart. These are all drawn on too small a scale to be of much utility. No. 7 is a map of Austro-Hungary and the neighbouring countries. The heights of the mountains and depths of the sea are given in metres, and the importance of the places named on the map, as regards population, is indicated by symbols.

CHARTS.

French Charts.—No. 4405. Ports de la Côte Nord-Ouest d'Islande: Patrix Fiord, Svendseyre (Talkna Fiord), 1890.—4226. Tunisie, Du Ras Marsa au Ras Dimas, Golfe de Sousse et de Monastir, 1887.—4235. Tunisie, Du Ras Kapudia au Ras Ungha. Iles et Bancs Kerkenah, 1889.—4236. Tunisie, Du Ras Kapudia à Sidi Makluf, Partie Nord du Canal des Kerkenah, 1888.—4237. Tunisie, De Sidi Makluf à Sfax. Iles Kerkenah, 1888.—4239. Tunisie, De Maharès à la S'Rira (Golfe des Gabès), 1889.—4240. Tunisie, De la S'Rira à Gabès, 1888.—4242. Tunisie, De Gabès au Bordj Djilidj (Golfe des Gabès), 1888.—4243. Tunisie, Canal d'Adjim. Entrée Ouest du Bahiret el Bou Grara, 1889.—4245. Tunisie, De Sidi Garus (Bahiret el Bou Grara) à Tarzis, 1889.—4247. Tunisie, De Tarzis au Ras Ashdir, Bahiret el Bibam, 1888.—4315. Méditerranée, Côtes de Tunisie, De Tunis à Sfax, 1889.—4316. Méditerranée, Côtes de Tunisie, De Sfax au Ras Ashdir, 1890.—4381. Mer de Chine, Annam, Du Cap Tourane au Cap Batauan, 1890.—4414. Mer de Chine, Côte d'Annam, Baie de Ku-Mong, 1890.—4403. Mer de Chine, Tonkin, Iles Lo-Shu-Shan, 1890.—4379. Côte N.O. de Madagascar, De la Baie Ampasindava à Nosy Saba, Iles et Port Radama, 1890.—4399. Côte N.O. de Madagascar, Baie Ambavanibe (Port Liverpool), 1890.—4401. Afrique Occidentale, Golfe de Guinée, Ile du Prince, Baie San Antonio, 1890.—4410. Océan Pacifique Sud, Iles Santa-Cruz, 1890.—4438. Océan Pacifique Sud, Nouvelles Hébrides, Ile du St. Esprit, Côte S.E. Canaux du Segond et du Bruat, 1890.—4406. Océan Pacifique Sud, Archipel de Santa-Cruz, Ports et Mouillages: Baie Graciosa, Hâvre du Basilisk, 1890. Service Hydrographique de la Marine, Paris.

North Atlantic Ocean.—Pilot Chart of the —. April 1891. Published monthly at the Hydrographic Office, Navy Department, Washington, D.C. Richardson Clover, Lieut. U.S.N., Acting Hydrographer.

PHOTOGRAPHS.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. When purchased photographs are presented, it will be useful for reference if the name of the photographer and his address are given.





PROCEEDINGS
OF THE
ROYAL GEOGRAPHICAL SOCIETY
AND MONTHLY RECORD OF GEOGRAPHY.

Travel and Ascents in the Basardjusi District, Daghestan.

By G. P. BAKER.

(Read at the Evening Meeting, March 23rd, 1891.)

Map, p. 380.

THE group of mountains to which I desire to direct your attention to-night lies at the extreme east of the main chain or waterparting of the Caucasus, distant from the central pass (commonly called the Dariel, from the gorge of the Terek it traverses) 190 miles, and from the Caspian Sea 60 miles. This main chain is, from the Mamisson Pass eastward, limestone. The granites of the Central Caucasus reappear in the Schebulos group, east of Vladikafkaz, which appears to continue geologically the axis of the chain.

Seen from the south, from the bare waste of the Steppes of the Kur, or from the orchards and forests of Kakhetia, the chain of the Caucasus presents itself as a lofty but comparatively level crest, hardly snow-flecked in late autumn, and capped by no glacier-bearing towers or pinnacles; towards its eastern extremity, however, the traveller, sufficiently high on the foot-hills of the Armenian tableland, sees a cluster of broad summits, which assert themselves as independent mountains. These are the peaks of the district over which Basardjusi, 14,722 feet, presides. His most important neighbours are Shalbuz, 13,679 feet, Shah Dag, 13,751 feet, Tfan, 13,764 feet, and their exploration forms my subject to-night. They have not, hitherto, been visited by Western travellers, and our knowledge of them is mainly derived from an excellent article by Dr. Radde, your gold medallist, and the curator of the museum at Tiflis, in Petermann's 'Mittheilungen,' in which it is suggested that mountaineers should turn their footsteps to these most eastern of the glaciers of the Caucasian isthmus.

Last autumn, in company with my friend Mr. George Yeld, I visited this district. We were both experienced Alpine climbers, and took with us the necessary arms of a climber—iceaxes and ropes. From Tiflis

we took on an interpreter named Gerome Realini, a Piedmontese, who has travelled with other Englishmen. Our explorations were limited to the Basardjusi district. But I may remind you that this is but a corner of Daghestan, "the mountain-country," which fills a triangle, of which, speaking broadly, Derbend and Baku and Vladikavkaz stand at the three angles—a region of bare bleak heights and tremendous defiles, dominated by ridges running at an angle to the waterparting, and continuing the general direction of the ridges of the Central Caucasus. Amongst these the Bogos group is iceclad, and appears to be the most important.

From Evlak, a station on the Tiflis-Baku railway, we were driven by Tartars in two rough "phytons," or post-carts, to Nukha. The journey was accomplished in twelve hours, and led across the river Kur and an uninteresting steppe; then, mounting a low range of hills of conglomerated sand and gravel, we crossed a dusty tableland of hard dried mud, 900 feet above the sea. The dust and heat were very oppressive, but were somewhat mitigated by the very excellent water-melons of huge dimensions which abound in this region. Towards evening we came to a large oasis, where there were herds of cattle, buffaloes wallowing in the water, and many magpies. The trees growing in this spot were of a beautiful emerald green. The route gradually descended to Nukha, a large and straggling town situated at the foot of the mountain range.

Here we were fortunate in being able to engage a party of Lesghian mountaineers, traders in native homespun cloths (who were returning to their country across the range), near Kasi Gumuk, after disposing of their merchandise at this important trade centre.

They are in appearance a very wild and uncouth race, their shaggy black sheep-skin busbies overhanging their eyes, and their large skin cloaks making them look most ferocious. The reputation of this race in the past as brigands and outlaws gave one a somewhat uncomfortable impression as to their probable behaviour towards us.

Three of these men with their horses were employed to take us to Shin, a village at the foot of the Salawat Pass. A Cossack was also of the party, sent by the authorities to help us to procure the necessary men and horses for our further journey.

The road to Shin skirts the wooded slopes of the main chain of the Caucasus. It is well made, and planted with an avenue of walnut-trees.

We passed through two or three villages almost hidden in luxuriant foliage, and watered by pleasant running brooks. The apple, plum, walnut, hazel, apricot, peach, tamarisk, and mulberry grew in wild confusion. The valley of the Alazan is the Vale of Kashmir of the Caucasus, a beautiful and wide-stretching oasis, or rather belt of fertility, between the bleak heights of Daghestan and the barren dust-swept steppes of the Kur.

The village of Shin is a poor place, inhabited during the summer months by Lesghians.

The women were exceedingly shy, hiding behind trees, and although completely enveloped with the yashmak, they would peer at one with only one eye through the small hole in that garment.

After a continuous wrangle of four hours' duration we secured three pack-horses and got under weigh, the Cossack returning to Nukha.

Our plan was to cross the Salawat Pass—traversed two years ago by an Englishman, Mr. Abercromby, the author of an instructive book on Daghestan—and then made our way, by by-ways, north of the chain to Kurush, a village described by Dr. Radde as the centre of the group of peaks whose better acquaintance we desired. The mountains as we ascended continued to be beautifully timbered, the red and white beech abounding.

The bed of the torrent was divided most curiously into three terraces, as though the work had been done by man, the lowest being mud, which at this season was more or less dry. Each stratum appeared level and uniform, and slate was seen in all directions. At a junction of the main stream with one which descends from a fine sharp rock-peak, the path winds down one of the upper torrent deposits, and then, crossing the stream, we mounted the hills by a fairly wide horse-path. The vegetation was rich in herbaceous plants; we revelled in raspberries and blackberries, and feasted our eyes on the woods of cherry, maple, and limes, the blossoms of which scented the air. At a height of 5300 feet the path wound round the mountain and entered the vale before mentioned. By a series of good zigzags, the summit of a ridge, where the oak takes the place of the beech, was reached. The forest scenery was generally finer than we had anticipated.

At a height of 7400 feet we camped on a level greensward commanding a wide prospect over the steppes.

The Salawat Pass is considerably traversed, being the highway between the railway and Central Daghestan towards the north, and Ahti and Derbend on the east. Above the region of trees it has good pasturage, frequented by many flocks of sheep, a small breed with a stumpy broad tail, a variety common throughout Asia Minor.

There are three shelters on the Salawat Pass, whose height is 9283 feet, one on the green slopes on the south side, another near the highest point, and the third at the foot of the ridge, on the north side, leading down from the pass. These subterranean shelters are known to the natives as caravanserais, and are so marked on the map. They are inhabited during the winter months in the hope of saving life. A large stone monument marks the spot where the natives have fallen victims to the severity of bad weather.

The character of the mountains on the north-east side of the

chain is desolate in the extreme, exhibiting a marked contrast to the forest-clad slopes on the south side. The power of water seems terrific, and a photograph taken on the descent shows how the rain has swept off the turf from the slopes.

At the northern foot of the pass, and at the junction of the two Shin or Salawat passes, near the third so-called caravanserai, we pitched our tent at 8000 feet.

There is no peak between the two passes as shown on the 5-verst map; the summit there marked 11,948 feet appears to be a peak lying more to the east, and furrowed by gullies with extremely sharp ridges between them, as are most of the mountains hereabouts.

During the process of unpacking, six wild-looking Lesghians, mounted on horseback, who had been seen coming down the path, halted before us and demanded medicine, two of them making as though they were ill; but as it seemed that they were shamming, and probably only desirous of finding out the contents of our kit, I countermanded the orders to unpack, and we all stood ready for an emergency. Needless to say their request was refused, and to our satisfaction they quietly withdrew.

The track leads down a treeless, though in some places grassy valley. The torrent ravages the whole valley-bed, which is a scene of wild desolation. A feature of this part was the number of springs oozing out of the mountain sides. Just as we entered the main Aechti Valley, which lies at right angles to the small one we had descended, we passed some women with huge bundles of thistle-plants on their backs; we understood they were used as fuel. At this junction we enjoyed a pleasant surprise in the shape of a beautiful meadow with rich clover and many flowers.

The first village, Bursh, contains 70 houses and offers no attractions to the traveller. The population seemed large; the men squatting about in groups. Rope-making, of wool, was going on in the torrent-bed, the women using, for the purpose of twisting, a piece of wood with a handle at one end, very much the shape of the key used to enlarge a dinner-table. The men were all of large stature and burly, and, as our horseman Ali remarked, "are animals, not men."

The scenery continues stern and treeless between Bursh and the next village, Khnoi, which is rather picturesquely situated at the foot of a crag several hundred feet high. The village is said to contain 170 houses, and its inhabitants own some 60,000 sheep, the wool realising from 4*d.* to 5*d.* per lb.

There is a pass leading to Nukha from this place, not indicated on the map, which can be reached in one day. A high square tower, crowned with a projecting cornice, adorns Khnoi; it serves, we understood, the purpose of a minaret to an adjoining mosque.

Passing through the narrow winding alleys, we suddenly entered a

small village square, where squatting about were congregated a score of men, waiting their turn to be shaved by the barber. They did not like our intrusion, and as we went along they jeered at us, two or three urchins throwing stones. For the second time during the day we noticed a few willow and aspen trees. At a spot in a lateral glen of the main valley, close to a patch of barley, and out of sight of the village, we pitched our tent. Whilst our meal was being prepared, we were visited by an old man, who salaamed us with the usual "Hosh gildin," Welcome! He cross-examined us at great length on the object of our journey, where we were going, and why we did not take advantage of the hospitality of the natives and occupy the guests' room of the village.

The character of the scenery becomes more interesting as the valley contracts into a picturesque defile. The Lesghians are good road-makers, and in one place where the road is several hundred feet above the bed of a roaring torrent, we came to a tunnel 90 paces long. Shrubs and flowers increased, of which we collected many specimens.

On the right hand of the stream we passed one or two lateral valleys, thinly inhabited. At 4500 feet we crossed the main stream and came to a lateral torrent, which descends from Mesa. Our object was to reach Kurush, the centre of these Alps, through a valley hitherto untrodden by the foot of the Western traveller. Its aspect gave rise to a longing desire to penetrate the dark and gloomy portals which might lead into unknown and mysterious regions. There was a certain feeling of excitement in our minds when we realised that we were exploring a country which till a few years ago was reputed by travellers to be infested with brigands and semi-barbarous mountaineers. It is due to the military discipline exercised by the Russians since the revolts that took place during the last Turkish war that this state of things exists no longer. We were given to understand that on the occurrence of robbery or any similar outrage the Government imposes a heavy penalty upon the nearest village.

The Mesa Valley at its mouth is about 150 yards wide. We were unable to find the path which is represented on the map to be on the left bank of the torrent, and were compelled to mount the pack-horses, sprawling ungracefully across the piles of baggage and firewood; the situation being by no means agreeable, as we stumbled, splashed, and collided along the broad though shallow rapid torrent.

The condition of the slopes on each side of the valley is extremely rotten, as they are composed for the most part of torrent débris. Forging the stream again to the right bank, a path, no wider than a sheep-track, winds up over a most treacherous and rotten steep slope. Our interpreter was nervous, and we were reminded by our Lesghians that we were running the risk of losing the horses and the baggage.

The stream, several hundred feet below, fretted and foamed within

its narrow limits. In one place we saw a bridge far below us, which we reached by a steep descent. I waited at this spot till the party crossed the torrent by a rustic bridge, and was able to take a photograph of them as they ascended by the zigzag path on the opposite side.

Farther on, as the valley opens out, the hill-sides are less steep and savage, and the slopes and bed of the valley are under cultivation, plots of barley and rye being dotted about, the Mesa people making the best of every available patch.

The track led us to a curious formation of sugar-loaf pinnacles, on the edge of a side stream. They are formed of conglomerate of gravel and mud, and show the immense power of water. Starting from a base, 4 or 5 feet in diameter, they taper to a point rising in height 20 or 30 feet, and are sometimes still capped with the large slab or boulder to which they owe their existence. The main torrent plunges through gorges almost abysmal in places, a notable characteristic of Daghestan.

We camped just below the village of Mesa. The Yusbachi of the village visited our camp, inviting us very courteously to put up in the village, a proposal we declined, though we accepted instead the services of a man to keep guard over the horses.

Mesa is perched on the hill-side, overlooking the steep sides of the main torrent, and the general dulness of colour and sameness of architecture are relieved by a brilliant emerald patch of poplar-trees below the village, which mark the common resort of the inhabitants.

The formation of the valley above Mesa for the next three or four hours, as we approached a pass or slight depression in a ridge trending east from the main chain, is less precipitous, but more water-devastated. The track now became very difficult, and in one place I was deputed to cut a path with my axe on the steep slopes for the horses, whilst the men held on by their bridles and tails, to prevent them from slipping down the slippery slopes, which at this point were 1000 feet or more above the torrent.

Before entering Echir we had our first view of the double-headed peak Shalbuz, with its precipices of red and white limestone, springing up at the head of a valley whose green pastures and patches of corn, dotted on the hill-side, added considerably to the picture. It was a glorious view, and was a fit reward for our perseverance by "barren cliffs, desolate gorges, and crumbling paths."

The people of Echir—a village of fifty houses, 7500 feet—came out like bees to examine us. Our men of Shin could not make themselves understood in their own Lesghian patois, and resorted to Turkish, as they had already done in the other villages we had passed through. It is curious and surprising how universal the Turkish language is throughout the whole of this district. It is spoken amongst the Georgians, Tartars, Armenians, and Lesghians, and appears to be the classical language of these peoples.

The path from this place to the pass is better, a fact which is no doubt due to the comparative richness of the pasture lands. We passed a herd of black cattle and saw many flocks of sheep. Thin fleecy clouds were occasionally seen playing about on the south side of the summit of the pass, and we felt that we were approaching one of the most interesting spots of our tour. So it proved, for from this pass the traveller commands a grand view of all the most important peaks of this group.

On the pass, 9250 feet, we were greeted with a blast of wind and mist, and it was some minutes before we were rewarded with a view. Then we saw, facing us and to the south-east, Basardjusi, a fine pyramidal peak, the upper part robed in cloud. To the north-east was the double-headed Shalbuz; to the east, the massive limestone plateau, Shah Dag; to the south, a peak, we afterwards understood to be Messent, though not clearly indicated on the map. The whole formed the sides of an amphitheatre. The bed of the valley between the mountains was of a rich green, with the silvery traces of two streams wending their way north-east, to swell the waters of the Samur.

It was a time of great excitement to me while I took photographs, watching my opportunity of exposure as the mountains appeared, only to suddenly disappear again as the clouds rolled up.

We suddenly found ourselves in a beautiful fog-bow, which was due to the brilliant sun at our backs, whilst we were enveloped in cloud.

It was late before we descended into the Kurush valley, where we were attacked by some infuriated dogs at a shepherd encampment.

The following forenoon (Sunday) we enjoyed in the meadows, which were full of flowers, the most noticeable being the yellow and lavender *Scabiosa caucasica*; the white pink grew in large patches, giving forth a delicious perfume.

At the moment we entered Kurush, the village council, comprised of thirty or forty men, all squatting on the greensward in a large circle, were sitting in judgment upon some shepherd who had allowed his sheep to trespass on a neighbour's corn. Russia grants limited "home rule" to these mountaineers; all petty offences and civil matters being settled amongst themselves, whilst criminal cases go before the chief of the district, who is either a Georgian or Russian.

A motley crowd, headed by the Yusbachi, escorted us through the village, "a journey terribly strong in odours."

Kurush (8100 feet) is built on the projecting buttress of a precipitous hill at the foot of the mountain of Shalbuz, several hundred feet above the left bank of the Usun-tchai, an affluent of the Samur. The Lesghian village is generally erected in a naturally impregnable situation; in the case of Kurush, any attack from the south-west or east could be easily repulsed by a small number of men.

The village was a sad disappointment. The houses—it is said to

possess 700—are identical in architecture with those of Mesa. The higher the traveller ascends in the mountains the lazier the men are, and the more industrious the women. During our stay a large number of men, many of them young, lounged about, some squatting smoking, others silent, and some quarelling. "To work," they say, "is a disgrace, we are men!" On the other hand it is astonishing how much the women have to do. They make bricks, build houses, make the cow-dung cakes of fuel with their hands, drag heavy sacks of grain down to the mill at the foot of the village, and carry up again the sacks converted into flour. They collect the hay and thistles and carry them into the village on their backs, and in addition to this have the many duties of the house to attend to. Girls are seen carrying on their shoulders large copper pitchers filled with water which they fetch from a spring half-way down the mountain-side.

It is at present unknown to what race the Lesghians of Kurush belong, and what is their origin. Dr. Radde, of Tiflis, the great authority on this district, who has visited Kurush and some of the surrounding valleys, is uncertain on the subject. They are evidently of a mixed type—the brunettes predominating in both sexes. They have black hair, light grey eyes, and somewhat flat faces.

The women do not affect the modesty noticeable in the steppe country, their faces are veil-less, their costume being identical with that of the ordinary Tartars of the steppes. Their garments are made of red and yellow cotton prints of Russian manufacture, only the headgear being of native industry, which is a silk gauze handkerchief produced at the town of Schemacha. Some of the head-dresses are tastefully decorated with coins.

Some few rugs are made in Kurush, and in fact in every village in Daghestan. The design peculiar to this place is the same as photographed by one of the members of the Alpine Club at a Tartar village in the Western Caucasus.

From the balcony of the Yusbachi's house the view was very fine. The great western (highest) peak of Basardjusi sends a noble rock-ridge down to the torrent at the foot of the village, while on the south-west side a long ridge runs down towards a gap between Basardjusi and a peak to the west, called by the natives Messent.

The great mass of Basardjusi trends from north-east to south-west. It has an eastern peak of fine form, a central peak (or rather mound), and a western peak (the highest), so conspicuous from Kurush. The summit ridge is of snow and ice, and the whole northern face of the mountain streams with glaciers (as the photo shows), while a huge snow cornice extends along the ridge. From Basardjusi's eastern peak a ridge runs down towards Shah Dagh to the pass between Kurush and Kuba and Kut-Kashin. In this ridge there is a considerable peak called Chelogle, and a less conspicuous point, ascended by us, named Kishin Dagh (12,500 feet).

Towards the east is the gigantic plateau mountain of Shah Dag, the cliffs at the extreme west end of the mass being called Kisil Dag, or red mountain, which rises several thousand feet above the right bank of the torrent Usun-tchai. The base of Kisil Dag is like an immense rubbish heap—white and red limestone boulders and huge accumulations of débris.

We were glad to leave the village and take once more to camp life. We engaged a native hunter, a tall handsome man of Jewish type, for the purpose of keeping our larder provisioned. Ascending the mountain at the back of the village (buying a sheep *en route*), we camped at 9500 feet on the south-east side of the double-headed rock-peak Shalbuz—a mountain famed in Arabic literature as the habitat of the monstrous bird the Roc, whose wings, when open, obscure the sun, casting a shadow on the earth.

The scramble up Shalbuz is an interesting one; the mass, like its neighbour Shah Dag, is composed of Jura limestone of middle formation. These peaks do not form part of the main ridge of the Caucasus, but are at right angles to the watershed. We ascended towards a gap in the mountain, which we had fixed upon as the most promising point of attack, hoping thereby to find a route. We scrambled round several obelisks and pinnacles of red rock which formed part of the final peak. Many specimens of shell fossils were found at this spot. At 10 o'clock a.m. we reached a cairn above the gap, altitude 12,800 feet; then taking to a friable ridge on the south peak, reached the summit at 11.20, 13,340 feet by aneroid. The view of the Samur river, with its road beside it and little groves of trees, made a welcome relief to the bare slopes. Some part of the summit ridge was of white limestone, the north peak being of red, and apparently a little higher. A cairn was on the highest point of the south peak. We saw the faint line of the Caspian Sea. Descending to the col between the two peaks by some very rotten rocks, we took to a steep snow slope on the east face of the mountain, which we soon crossed, and reached the top of the cliffs immediately above a plateau. From this spot we had a good view of a conspicuous Mahomedan shrine, which, from our point of view, looked like a building, but which on closer inspection proved to be a natural formation of red slabs of sandstone.

The height of this place is 12,000 feet. On the east side of the shrine are large dolomite looking blocks of white limestone which form the outer barrier of the peaks on the east.

The place is much frequented, a number of pilgrims were leaving as we approached. It is covered with twigs to which were tied pieces of rag. Surrounding the shrine are many walled enclosures used for the purpose of prayer. Close by, on a prominence, is the place of sacrifice. We saw the blood and entrails of sheep newly killed.

The object of our journey to Daghestan was to explore, botanise,

and photograph, with a little mountaineering if opportunity offered. The success of our scramble on Shalbuz incited us to attempt the ascent of Basardjusi. We examined very carefully the north-west ridge of the mighty Basardjusi, and although we agreed it might be a very interesting route by which to ascend the peak, we decided that it was not for us. At the same time we hoped that, by careful exploration of its eastern and southern flanks, a weak place in the defences might be found. We accordingly left the slopes of Shalbuz. Gerome, with one of the men, was sent into Kurush to buy firewood and provisions, whilst we wandered where we pleased for flowers and photography—the meadows are rich in herbaceous plants of many kinds. Shah Dagħ looked like a huge deeply moated fortification with a double row of towers. Crossing the Usun-tehai below Kurush, we came to the boundary of the chalk of Shah Dagħ and the slate of Basardjusi, and rejoined our caravan on the way to a new camp under Shah Dagħ's outer barrier. On the way we were twice attacked by huge dogs, a very common experience during our tour.

Our camp was at a height of 9800 feet. Looking back towards Kurush, which lay below us, on our left the white head of Basardjusi, with his snow cornice and ice-falls, stood out in the twilight, and on our right the many-towered bastions of Shah Dagħ filled us with admiration. It was cold in the night; temp. 39° F. in the tent.

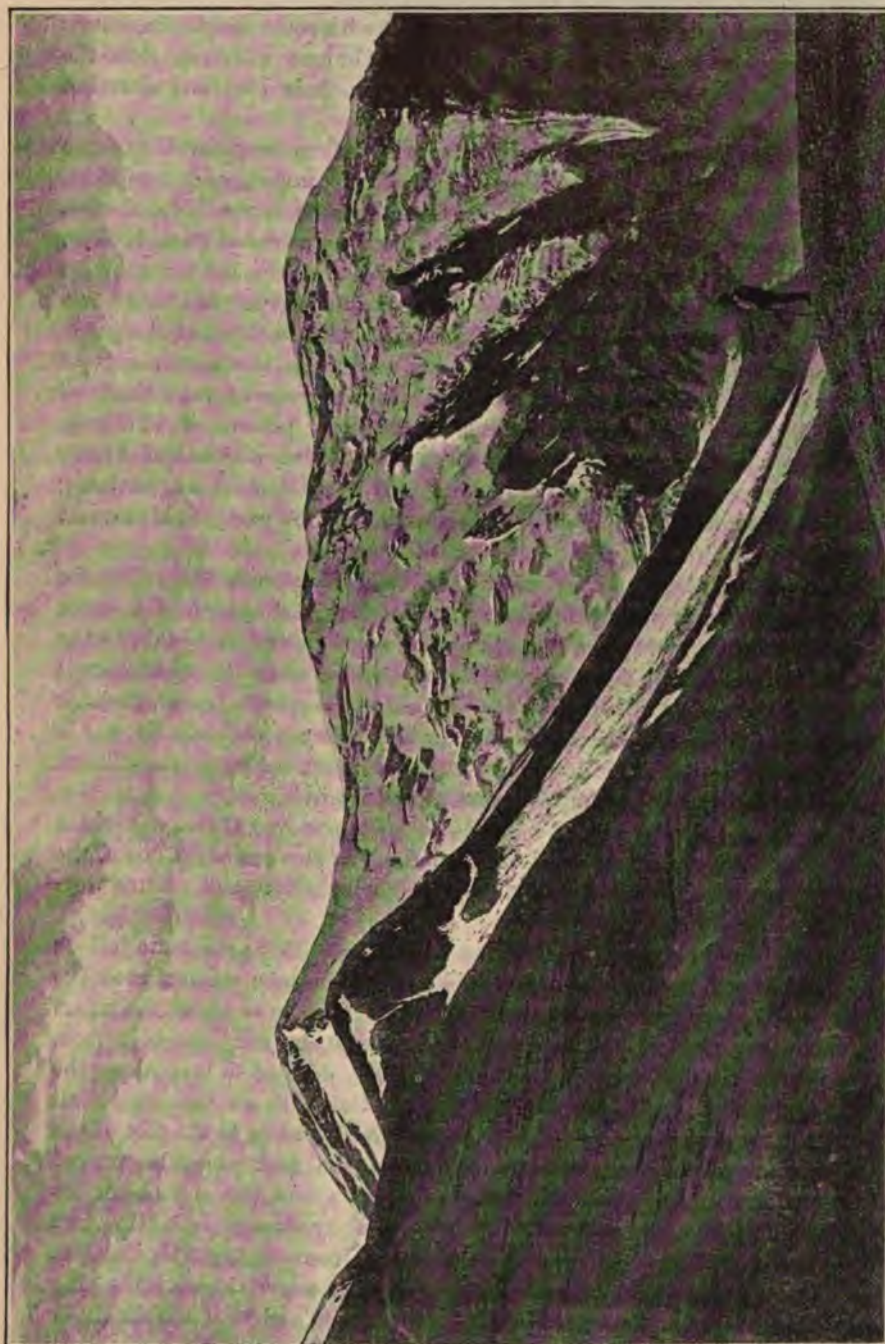
The next day we ascended the slaty point Kishin Dagħ, 12,500 feet, by the main ridge leading towards Basardjusi, which joins the path at the pass just above our camp. From the summit we saw enough to convince us that the chances would be against us (considering that our party consisted of two only) in an attempt on the eastern peak of Basardjusi from this side; the last part of the ridge, which abuts on the eastern peak, being, so far as we could see, narrow and steep.

The view taught us some topography. The vast size of the Shah Dagħ plateau astonished us. South-east of this mountain is another red peak of the Shah Dagħ style.

The ascent of Kishin Dagħ presents no difficulty, though on our way we turned off the ridge on the north side too soon and had to cross a detestable rock-face. At an altitude of 12,000 feet we came to a geological dyke, extending right across the ridge; it contained some thousands of balls and other ferruginous concretions.

We struck camp the same afternoon and crossed the pass, 10,000 feet, which leads to Kut-Kashin on the right, and Kuba on the left.

Skirting the base of Basardjusi at the junction of the torrents in the Pirli Jailach of Dr. Radde's map, we came upon an extensive oasis. It was comparatively level ground with good pasturage. Large flocks of sheep, numbers of horses, some goats, and many cattle were in sight. Our path led into a deep valley of excellent pasturage, where, opposite the point where the direct Kut-Kashin route diverged from the track which leads round Basardjusi, we again pitched our tent. The men



NORTH-EAST SLOPES OF BASARDJUSI FROM THE CAMP UNDER SHAH DAGH.

were obliged to collect dry dung for fuel; water froze during the night. We entered into negotiations for a cheese with some shepherds, but as an attempt was made to impose upon us, Gerome withdrew from the bargain, which created considerable anger on their part and alarm on ours.

On the following morning we proceeded to explore the gorge at the head of the valley in which we had camped, and named on Dr. Radde's map, Jatush-dere. In several places it was blocked with avalanche snow. The torrent (fed by the three glaciers of Basardjusi on our right and the two glaciers of Basar Jort on our left), worms its way through a subterranean passage under the snow. We met some pilgrims on their way to the Shalbuz shrine. At the head of the gorge we passed a broad glen running up under the southern slopes of Basardjusi, and farther on we came to a small oasis at an altitude of 10,000 feet. Our horses exhibited marvellous powers of climbing, pluck, and endurance, continuing the ascent till an altitude of 11,600 feet was reached. At this point we again pitched our tent, retaining the man Ali, and sending back the remainder of the party to bivouac at the before-mentioned oasis.

My friend Yeld went off to explore, whilst I mounted guard at the camera and managed to obtain an extraordinary photograph of a sea of cloud, extending over the steppes to the mountains of Karabagh, in the vicinity of Lake Gotchka, 80 miles distant, some of which stood out like the fingers of a hand. The snowy dome of Ararat, familiar to me in 1878, lay behind the range, and was not visible. It was a wonderful sight—the billows moved gently along, filling up the valleys, and leaving exposed the upper parts of the ridges.

At about six o'clock the clouds ceased to move, there was not a breath of wind, all was calm and still, and as the sun went down, the snowy peak of Charrou "shone like a golden altar, and nature worshipped in silence."

Before sunrise on the morning of August 22nd, we were off to ascend Basardjusi. Guided by Yeld's reconnaissance we mounted the slope at the back of the tent, and soon reached the crest of the ridge. From that point we were able to decide upon our line of attack. Several routes were open to us. We finally decided to keep along the ridge we were on, till we came to the junction with another ridge full of nasty rock pinnacles, which we hoped would lead us to the foot of the final snow slopes. On closer acquaintance the rock pinnacles proved easier than we expected. From this point the ascent was more laborious than difficult, much rock work, much loose slaty scree, culminating in a snow slope, at the foot of which was some ice requiring step-cutting. We now put on the rope and climbed by the snow ridge overlooking the glacier on the southern side of the mountain, and kept within six or more feet of the edge, which is slightly corniced.

By steady plodding—it required but a good kick to make a firm footing in the snow—we soon reached the first dome, estimating the slope to be 700 feet, a second dome, but a higher one, lying more to the north, which constituted the summit of Basardjusi, by our aneroid 14,620 feet, against 14,722 by the Russian survey.

Neither here nor on the rocks close at hand was there any sign of a previous ascent. The snow and ice work was not formidable, but there had been enough of it to stop the native and the Russian surveyor. The highest traces of previous visitors we found were piles of stones some 1500 feet below the top.

We shook hands in silence, too much satisfied to speak. It was worth the journey to Daghestan.

The day was glorious, not a cloud above, nothing but the sea of cloud *below*, hiding the Georgian Steppe, with here and there above it a fairy-like scarf of vapour floating in the blue sky. As my friend observed,—“It was as though nature deigned to reward the mountaineer who penetrates the secret places of her reign, by hiding the dreary flats and monotonous plateaus of the steppes which lead on to her mountain home.”

Turning westward we made for the rocks so conspicuous from Kurush. Here we laid out such provisions as our fishing-basket contained, and then we turned to the view. We eyed with satisfaction the village of Kurush, with its deeply cut torrents, and remembered how we had half despairingly admired the great north-west ridge that now lay below us, instead of above.

The mountains to the north, in the vicinity of Dulti Dagh, were not interesting from our point of view. The ridges nearer to us, in the same direction, trend east to west, whilst west of Basardjusi they run north to south.

The red peaks of Shalbuz showed up, a great contrast to the black foreground.

Shah Dagh's double row of bastions, and its vast size, did not impress us. We built a cairn, and left our cards in a small lozenge-box.

Before leaving the summit, Yeld payed out the rope to allow me to examine a huge hole in the cornice overhanging the north side, which had awed us in our view of the mountain from our camp under Shah Dagh.

It was getting very cold when we turned to depart at about 11 o'clock. We made no change in our route till we reached the ice slope, which we avoided by taking to the rocks. At 13,200 feet we came across several bunches of a *Cerastium*. At 13,000 feet the clouds began to gather on the upper ridges of the main chain. We raced down the screes into camp, and were welcomed by Ali and Mehemet, who had come up, as arranged, with one of the pack-horses. Without any delay we proceeded on our return to the bivouac at the oasis, where we learnt

that they had been visited in the early morning by a herd of 25 or 30 ibex.

We met a man on horseback, who happened to be the Yusbachi of the village of Bum. He put us on the track leading to a pass over the main chain 11,300 feet in height, and then turning westward we descended by zigzag paths to a ravine at the head of the Bum valley, where, under some huge rock-walls, immediately under our Basardjusi camp, we pitched our tent at an altitude of 8800 feet, as far as I could judge from my aneroid, which had now become considerably disturbed by the state of the atmosphere.

The green slopes outside the forest limit afforded good pasturage for the many large flocks of sheep we passed. Rich as the country is to the botanist, I may remark that the sheep get the best of the flowers, and over and over again we were unable to gather specimens because of their depredations.

For the first six hours of descent in the Bum valley the gorge contracted so much that the torrent-bed is more often than not the only track—we crossed and recrossed the impetuous stream twenty-eight times. Early in the afternoon, after our meal in a beautiful glen, rain began, and increased in violence till it became torrential. To be caught in a storm in such a ravine would have been no joke, and we congratulated ourselves that we had got far enough into the valley to escape from the torrent-bed and take to the beautifully wooded slopes. The thunder seemed to burst in our very midst, and then went crashing and echoing through the ravines as though it would rend the very mountains. We plodded on, "drenched, deafened, and dazzled."

The men, and the horses too, behaved remarkably well—willing servants at all times to carry or help us across the streams. Never once during the short campaign had we the least trouble with the pack-horses, and only on this occasion an accident with one of the men, who, trying to emulate my example of jumping from rock to rock across the stream, slipped off a slimy rock into the water, camera and all being submerged.

Notwithstanding the discomforts, and even dangers of the greasy and narrow paths, we collected some interesting specimens of lilies, campanulas, and large valerians. The beech-trees, of unusual dimensions, excited our admiration. The rank vegetation, 10 and 15 feet high, gave forth a heavy smell, and steamed with moisture. It was an awful downpour; there was no abatement; the sluice-gates of heaven seemed open; the torrent below us was already in process of flooding.

At last we emerged from the forest at a high level on the left bank of the torrent. Opposite to us, across the stream, we saw some rude sheds, which we understood were for the accommodation of visitors, who come here to some hot springs. It was terribly cold, with a keen wind at our backs, which was the more discomforting as we waited

occasionally for the caravan. At last, towards evening, we sighted a village, and made for the largest house, which fortunately belonged to the Yusbachi. He received us with great hospitality, and in a very few minutes we were stripped and in fresh clothes, the natives all the time crowding the room, and remarking that such white skins they had never seen before.

Kamaroffka is a new village on the left bank of the torrent, founded, we understood, by General Kamaroff, and is inhabited by Lesghians. The buildings are poor, of wood, and are said to be portable.

On the morrow—the storm had gone as fast as it came—all was sunshine. We examined Basardjusi's stupendous mass, nearly due north, rearing its snow-crowned summit above the green foliage of the lower heights of the valley, every rock on the peak being hidden by the snow of yesterday's storm.

We were thankful for the good fortune which had enabled us to make the ascent, and get clear of the ravine before the rainflood.

Had we been two hours later in reaching the forest ridges, we should have been in a deplorable condition—prisoners in the forest.

The vegetation, as we approached the village of Bum, was almost tropical: at first fruit-trees, then a paradise of blackberries, shrubs with their brilliant bunches of red berries, and the tamarisk also in fruit; then majestic plane and chestnut trees of extraordinary girth, while bunches of purple grapes hung side by side with walnuts and chestnuts, and from the topmost boughs of the poplar drooped, in sweeping festoons, the same graceful tendrils of the vine, waving softly above our heads their luscious burdens.

It seemed as though nature had lavished an undue share of her gifts upon this country. It was a place to delight the gardener's heart. We passed some men with falcons on their wrists.

I examined a primitive rice-mill by the side of a stream, with its pounders and mortars, all constructed of wood; a shoot or turbine set the wooden cylinder in motion.

At Kut Kashin, a large Tartar settlement, we managed to procure a three-horse "phyton," as it is called by the natives, and from thence we returned to Nukha, passing through several villages, notably the Armenian one of Nidshe, famous for its hazel-nuts, which are largely exported to the Nijni Novgorod fair. The buildings of Nidshe are enclosed with substantial walls, which are then surmounted with thick hedges. The gateways are huge, with ponderous doors, highly ornamented in many colours. We did not see the tails of animals mentioned by Dr. Radde as covering the doorways. Many of the habitations are surrounded with moats, which looked as if the days of marauders had not altogether been forgotten.

The undulating plains we passed through have a small population, and are little cultivated. There is an absence of proper

drainage for the over-abundant supply of water from the main range—the country consequently is malarious. In some places we passed through considerable irrigation for the raising of rice. Silk culture is the staple industry, but the silk is much deteriorated in quality by disease.

We met with a kindly reception at Nukha; and after paying off our men, took our leave of them and of other friends whose acquaintance we had made, with many expressions of mutual regret.

After the paper,

Mr. D. FRESHFIELD: I shall take occasion subsequently to place on record a few remarks on the subject of the general exploration of the Caucasus last year, but it may perhaps be convenient if I say now a few words on the subject of the country which Mr. Baker has described in his interesting paper. Mr. Baker has done what Dr. Radde said ought to be done, he has taken the camera and ice-axe into the district and completed the examination of the geological character and glacial structure of the highest peaks. You will see from the map that this part of the Caucasus is as far from its centre as the Gross Glockner from Mont Blanc. I have myself only twice seen these peaks, and on these occasions from great distances, once from a post station on the steppes of the Kur, and another time from the slopes of Ararat, where they looked very fine, crowning the long level wall of the eastern Caucasus. But I have always read anything about them with great interest. They have always formed a subject for tales of romance and robbery. In the first place, Mr. Baker has told you Shalbuz was the legendary home of the Roc of the 'Arabian Nights.' Do not let us be too hard on the Caucasians for having had their monstrous birds! It was only in the last century that we banished dragons from the Alps. You will perhaps hardly believe it, but in a work published by a Fellow of the Royal Society and bearing the imprimatur of Sir Isaac Newton,* a chapter, profusely illustrated, is devoted to the Alpine dragon. After seeing the reproduction of one of these plates on the screen I feel confident you will admit that Fellows of the Royal Society are far more successful than members of the Alpine Club in the matter of travellers' tales. All Daghestan was given up to robbery until forty years ago, and when we see the barren heights the mountaineers inhabit and hear from Mr. Baker of the vineyard country close to them, I think we need hardly wonder at the highlanders' habits. In late years several English travellers have been through the district, the best of whom, Mr. Abercrombie, has written a very instructive book. We must recognise at once from the large collection of photos Mr. Baker has brought home, that this region offers a very striking contrast to the Central Caucasus we know best. In the first place the character of the scenery is different: instead of finding granite peaks and aiguilles of every shape you see tent-shaped summits, red rock walls with small glaciers hanging on to them. The rainfall is not more than a third of that near the Black Sea, and consequently glaciers are scanty, and the snow-line is 2000 feet higher. One of the most interesting parts of the paper was, perhaps, the description of the shrine on Shalbuz visited by many Mahomedan pilgrims. I hope some competent person will soon write a book on the subject of mountain shrines, it might be made a most interesting work. They extend from Fujiyama away in the east through the Himalaya to the Alps, and show how long ago and how universally river and mountain worship have prevailed. At each of the principal sources of the

* Scheuchzer's 'Itinera Alpina,' 1st edition, 1703; final edition 1723, with the dragon chapter and other additions.

So there is a shrine there now dedicated to some saint, which I have no doubt represents an old form of river worship. There is still a very curious shrine, about 11,000 feet above sea-level on a peak near Mont Cenis, erected by a crusader who fell into the hands of the Saracens and vowed a shrine if he escaped from them; the summit is now called the Rochemal.

Mr. BAKER: I have brought for the inspection of the members a bronze bowl, purchased in Daghestan, which has been used in the ordeal by fire. Mr. Abercrombie speaks of these caldrons being used by the natives of Daghestan. The idea was that they contained molten lead, and that the trial consisted in the hand being plunged in to prove the innocence or guilt of the party. It bears an inscription which, from the translation we have been able to obtain, appears to make it belong to the time of Abu Bekr. I beg to return sincere thanks for the kind way in which you have mentioned my name, and your kind attention while I was reading the paper.

The PRESIDENT: As I have no doubt you will be anxious to go and see the photographs which are in the next room, I will merely say that it is very creditable to Mr. Baker to have been able to form so interesting a geographical paper upon an expedition, as I understand from himself, undertaken chiefly for amusement, and secondarily for botany. I make no doubt that you will wish me to convey to him the expression of your thanks. As for Mr. Freshfield, he always, when he addresses us, either amuses us or instructs us, or does both; and to-night I think no one will be inclined to deny that his dragon has been the great success of this meeting. You will, I am quite certain, include him in the expression of your gratitude.

*Two Journeys to Ta-tsien-lu on the Eastern Borders of Tibet.**

By A. E. PRATT.

(Read at the Evening Meeting, April 13th, 1891.)

TA-TSIEN-LU is a mountain village about 8400 feet above the level of the sea, in the province of Sz-chuen in West China—five days' journey from the borders of Tibet, and ten days' journey south-west from the Roman Catholic missionary station of Mou-pin, where Père David lived for some years, sending thence to Europe the valuable collections of mammals and birds which have made his name famous throughout the world. In the year 1889 I spent three months in this district with Mr. Kricheldorf, making collections in natural history, and revisited it again in 1890 for about the same time. The first stage of our journey to this remote district was from Shanghai to I-chang. The river Yang-tze is navigated for this distance of 1200 miles by steamers built especially in Britain for the river service, and commanded by English or American captains. Passengers change steamers at Hankow, and the whole journey occupies from ten days to three weeks, according to the state of the river and the time lost in waiting at Hankow for the next boat.

The journey from I-chang to Chung-king is generally made in Chinese houseboats, but these were not suitable for my purpose, as the smaller ones would not have been large enough to hold the collections I hoped

* For map of the route through Sz-chuen consult Baber's, in 'Supplementary Papers R.G.S.', vol. i. p. 202.

to bring back with me, and the larger ones were too slow and unwieldy, requiring a crew of at least thirty men; they are moreover badly constructed, and afford but little protection against the weather. I therefore had a boat built for me at I-chang, much after the Chinese style as regards the hull, but with an improved type of cabin filled with lockers to hold my collections and other things. The crew consisted of sixteen men, half this number being "trackers," whose business it is to pull the boat up-stream, the other eight being engaged in steering, managing the towing rope, etc. At many places where rapids occur extra trackers have to be hired, sometimes as many as fifty or sixty. Accidents frequently happen in these rapids, and as the wrecking of the boat would involve the loss of the whole season, the voyage is anything but a pleasure trip; coming down it is still worse, for then one is in constant danger of losing, perhaps through a moment's carelessness on the part of the skipper, the fruits of months of hardship and toil.

My first journey from I-chang to Chung-king was made in April, before the water had fully risen, and was performed in twenty-six days. Later on it would not have been accomplished so quickly; in June, July, and August, it is practically impossible to ascend the river at all. For one-third of the distance between I-chang and Chung-king the scenery is most impressive; the river winds its way through gloomy gorges, between cliffs rising sheer out of the water to a height of over 2000 feet in parts. The current is so strong that the boat must be towed the whole of the way up-stream, and as the only possible towing-path is sometimes on one side of the river and sometimes on the other, a great deal of time is lost by the trackers crossing and re-crossing; a favourable breeze occasionally allows us to sail a few miles. The Chinese boatmen, like sailors all over the world, believe in the practice of whistling for wind. While they are at work they chant songs, which at night has a very weird and melancholy effect. At dusk, at certain seasons, thousands of tiny lights, stretching for miles, are visible floating down the stream. They are small bamboo cups containing a little oil and a wick, and are supposed to be an offering to the souls of the drowned. Kwei-chau-fu is a large Chinese custom station, situated in Sz-chuen, close to the frontier of the province of Hupeh, where boats are delayed for examination before entering the latter province from Sz-chuen or *vice versa*. After passing this place the scenery becomes less rugged, and the country gradually assumes the fertile and well-cultivated appearance which it for the most part retains until we approach the confines of Tibet. At many points along the river gold is found in the pebbly sand which is uncovered at low water.

We arrived at Chung-king on the 21st of April, and were most hospitably received by Mr. Cockburn, the British Resident, who has spent three years in this humid and enervating place, where the sun rarely shines. The river at this part (1600 miles from Shanghai), at

high water, is considerably over a mile in width. Here we had to change some of our boatmen, as the I-chang men were not acquainted with the upper river, and did not care to go further from home. We left Chung-king on the 24th; the weather was then very hot, the shade temperature being sometimes up to about 100° Fahr. It is astonishing how much opium is grown in this district. We passed for days through fields of red, white, and purple poppies; they are planted in rows with great regularity, about a foot between each. In May the seed-pod is formed and the petals drop off. At this stage perpendicular incisions are made in the pod, and after an interval the juice is seen issuing through the incisions, having the appearance of burnt sugar; it is then gathered by means of a small bamboo spatula, until the supply is exhausted. Tobacco of two kinds is also largely cultivated. The country is not well wooded, but I noticed occasionally cedars, chestnuts, graceful clumps of bamboo, and the beautiful tree called in Chinese Lan-mu.

At Sui-fu, the great centre of trade for Yunnan, we left the Yang-tze and entered the Min, one of its largest tributaries. I should estimate the mouth of the Min river to be half to three-quarters of a mile in width. The great industry of this thickly-populated district on the banks of the Min is the manufacture of salt. On May 14th we anchored for the night at a place some fifteen miles below Kia-ting-fu, reaching the city in the course of the afternoon. Hardly had we moored our boat when we were greeted with a shower of stones, some of a considerable size. This was our first intimation of the presence in the town of several thousand students attending the triennial literary and military examinations. We lost no time in casting off again, a work of some danger under a hot fire of stones from the shore. The crowd followed us for some time as we drifted down the river. We anchored again about two miles below the city, and shortly afterwards received a message from the governor of the district asking us on no account to return until the examinations were over, as it would not be safe, owing to the excitement prevailing in the town during these examinations. The principal industries of Kia-ting-fu are the manufacture of silk and embroidery.

The French and English missionaries whom we had hoped to meet here had gone inland. During our stay the magistrate of the district paid us a visit of inspection, as it had been reported to him that our boat contained an infernal machine which we had brought for the purpose of blowing up the town. Having satisfied himself that we had no such intentions, he was very civil and friendly. Before leaving Kia-ting-fu we had our heads shaved, and got into Chinese dress, which we found a great convenience. The dress itself, being looser and lighter than European clothes, is sufficiently comfortable in summer; but the chief advantage of adopting it was that we attracted much less

attention from the inhabitants of the villages through which we passed.

As we had to leave the boat at Kia-ting-fu and travel overland to Mount Wa-shan, we were obliged to hire about thirty coolies to carry our baggage, consisting of collecting apparatus, etc., and we had considerable difficulty in dividing and arranging the loads among them. This is one of the great inconveniences of overland travel where coolies are the only carriers.

We left Kia-ting-fu on the 19th of May, and were not sorry to say good-bye to a place where we had met with such an inhospitable reception. After a very wet day's journey we reached Su-chi, a small market town of no particular interest. Next day our way lay through a really lovely country, beautifully watered by innumerable streams, reminding me very much of Hampshire. Here, for the first time, I saw that beautiful orchid, *Dendrobium nobile*, growing wild—a mass of pink bloom. Bamboo water-wheels for irrigation purposes were very common all along the road. Eight hours' travelling brought us to the town of Omei-hsien, seven miles from Mount Omei, the celebrated sacred hill so well described by Mr. Colborne Baber, which I had not then time to visit; I shall have much to say about it when I come to my second journey. We left Omei-hsien on the 21st, and on our way met many coolies carrying the eggs of the celebrated wax insect down from the mountains. These eggs hatch out if exposed to the sun, so they are generally carried by night. The method of production of this wax has been so fully described by Mr. Hosie and others that I need not dwell upon it.

After travelling through a very wild region, we reached an elevation of 5,000 feet, where I gathered, for our botanical collection, a lovely fragrant honeysuckle and a fine mauve-coloured primula, and saw some feathers of the famous Amherst pheasant. The road here was in many places a narrow footpath along the face of a precipice, not wide enough to allow two coolies to pass each other. At Lu-lu-ping the landlord of the inn where we slept handed me a fragment of the weekly edition of the *Times* of November 23rd, 1877, which had been left here by Mr. Baber on his way to Wa-shan eleven years previously. No European had passed this way since.

On May 24th we struck the main stream of the Tung river, which appears to divide the territory of the independent Lolos from that of the portion of this interesting people subject to the Chinese. We saw some of their dwellings, two-storied square stone houses with flat roofs, sometimes furnished with a look-out tower. The Chinese houses on the frontier are generally surrounded by a high stone wall, each house, except those of the very poor, standing in its own inclosure. This is meant for a protection against Lolo raiders.

We descended to Ching-ka-ho, which lies in a valley, and spent the night at a neighbouring village. From my bedroom window I observed

three or four antelopes passing along a ledge on the face of the precipice, about 40 yards from me. I went for my rifle, which was with my baggage in another house, and shot one of them. It fell right to the bottom of the cliff, a distance of 100 feet, where one of my coolies found him dead, amidst great excitement on the part of the Chinese. The Lolos hunt a good deal, with large packs of miserable-looking hounds. They hunt chiefly the wild ox, of the species which occur on Mount Wa-shan. My antelope supplied us with fresh meat for two days, and was a welcome addition to our larder. The traveller in these regions suffers considerably from having to do hard work without proper food. During our expedition we had to live chiefly on rice and Indian corn cakes, getting eggs and chicken occasionally. At Ta-chien-lu we were able to obtain yak beef, but the yaks which are killed for food are only those which are past work as beasts of burden. The meat is as tough as leather, and not, therefore, very valuable as an article of food. Three or four months of this vegetable diet tries the strongest constitution.

Passing by the side of a range of mountains we followed an affluent of the Tung river, and on the 26th May, thirty-two days after leaving Chung-king, reached Ta-tsien-chih, a long straggling village of detached clusters of houses. It stands at an elevation of 5,980 feet above the sea. Here we had the good fortune to meet a French missionary, Father Joseph Martin, who was visiting his converts, and who very kindly offered us a house formerly occupied as a mission station. He had spent twelve years in this remote region, and had no intention of ever returning to Europe. Most of the people here are Roman Catholics, and for the first time I saw Chinese joss-houses abandoned and in ruins. The house was a one-storied building, with a tiled roof, containing three rooms and a kitchen, and was a very pleasant change from the quarters we had been occupying, being clean and in fairly good repair. It stood on the hill-side, and just opposite the curiously shaped peak Wa-shan, towered into the sky 6000 feet above us. The mountain ends in a series of fourteen precipices, each some 200 feet high, the highest being only accessible by ladders. We soon found we had arrived too early in the season for the main purpose of our journey, the weather being so cold and wet that we were unable to do any collecting for a fortnight. The climate is very much like that of England—cold, rainy, and changeable; the roses were very pretty, but single, and strawberries were plentiful; and there is good shooting—wild ox, two species of antelope, two species of bear, and five of pheasant.

A few days after our arrival we ascended the lowest spur of the mountain and found the farther side covered with virgin forest. From the summit we had a magnificent view of the Ta-tsien-lu range, rising peak on peak away into Tibet.

After a month's stay at Washan I decided to move on to Ta-tsien-lu,

and started on the 26th June. The road leads over a pass some 10,000 feet in height, and then winds down into a steep ravine. We found travelling on foot along the mountain roads very laborious, and were glad to be able to procure horses at a small place near Fu-lin.

Fu-lin lies in a valley, altitude 2150 feet, surrounded by high bare mountains. Owing to its position in a valley into which a number of rivers run, the district is subject to frequent inundations. It is a great centre of cereals, Indian corn, barley, rice, and two species of wheat. I am told at Ta-tsien-lu there is a species of wheat grown in Tibet without a husk, and that it has been sent to Europe by the missionaries. A great deal of fruit is also grown at Fu-lin, pears and peaches. The pears are especially fine, some weighing as much as $1\frac{1}{2}$ lb., but they are only suitable for cooking. The Fu-lin flour is very good, equal to that obtained in Europe. A hard day's walk of 21 miles over bad roads brought us, on July 1st, to Lêng-chi. In the course of the day we crossed the Fei-yu-ling Pass, elevation 9020 feet. After crossing the pass we descended the Lêng-chi, a town near the banks of the Tung, not more than 3070 feet above the sea; it was very hot, and we spent a miserable night. Insect torments—mosquitoes, fleas, bugs, and a yet more objectionable insect—kept us from sleeping at all, and at 4.30 a.m. we made our escape from one of the filthiest dens I ever lodged in, even in China.

We reached Lu-ting-chau in ten hours, and crossed the suspension bridge over the Tung to Cha-pa, the French mission station. This bridge is a most curious structure; it is formed of loose boards laid upon a framework of iron which is suspended from two iron chains. The length, at a rough guess, is 150 yards, and the height above the river 150 feet.

Lu-ting-chau lies on both sides of the river; immediately after crossing you turn to the left and pass round the corner of a prominent spur of the mountains which run up to perpetual snow. The road for 150 yards round the spur is narrow and extremely dangerous; the path is of soft shale, and holes have to be made in which to place each foot-step; a false step would precipitate the traveller into the Tung river, which rushes directly below.

At Cha-pa we were glad to find two French missionaries, who, as usual, showed us all possible hospitality and kindness. Shortly after our arrival we had ocular demonstration of one of the dangers to which the inhabitants of this country are exposed. We were sitting in the mission-house, smoking and talking, when a storm with heavy rain broke over the place, and presently we heard a rumbling noise like thunder; going to the back of the house, and looking up at the mountains, we saw a torrent of liquid mud hurrying headlong down the ravine that descends into the Tung, carrying with it great masses of rock, and making in one place a leap of 200 feet. Crossing to the side of the

garden, close to which the ravine passes, we saw a sight I shall not readily forget. The ravine had been converted into a river of mud, sweeping along with it enormous fragments of rock, many of them certainly over a ton in weight; and where we were standing the ground trembled with the concussion of these great boulders striking the sides of the water-course as they were swept along. I can only suggest these floods are caused by the melting of the snow on the higher ranges, carrying with it rocks and soil, until, by the time it reaches Lu-ting-chau it is converted into liquid mud. Whole villages are often destroyed by them, but are invariably rebuilt on the same spot.

We left Cha-pa the next morning, and found much of the road carried away by the storm, and the Tung a roaring flood. After seeing the immense volume of water which at certain seasons this tributary pours into the Yang-tze, there is little cause to wonder at the sudden rises of the latter.

I noticed much tea, tobacco, and salt being carried to Ta-tsien-lu, and coming from Ta-tsien-lu for export to the east, hides, musk, and deer-horns. The bricks of tea, weighing about from 7 to 10 lbs. each, are wrapped in matting, and piled up on a bamboo frame on the coolies' backs; one man will carry about twenty bricks. The tobacco is packed in bamboo baskets. The coolies travel in gangs of fifty or sixty men. We reached Wa-ssü-kow in eleven hours from Cha-pa, and leaving it next morning, passed through a fine gorge, along which one of the affluents of the Tung rushes. Ascending a steep winding road, and turning a corner, we came suddenly in sight of Ta-tsien-lu, eight days' journey from Wa-shan, and forty from Chung-king. Here we were very hospitably received by Monseigneur Biet, the French missionary bishop of Eastern Tibet. We were surprised to find here Mr. Rockhill, an American explorer, who had just arrived, after a most perilous but brilliantly-successful journey, from Mongolia through north-eastern Tibet, by a route never before travelled except by Tibetans, and the very existence of which was doubted. As Mr. Rockhill's account of this journey is now appearing in the 'Century Magazine,' I need not repeat what he told me of it. We took up our abode in the house where Mr. Baber and Captain Gill formerly stayed.

Ta-tsien-lu is a most interesting town. All sorts of Asiatics may be met in its streets, and Europeans therefore attract less attention here than in other places where strangers are seldom seen. The natives of the place are the wildest looking people, invariably armed to the teeth; some of fine physique, tall and handsome, with long matted hair hanging over their faces. Women do all the work; they go out early in morning to collect firewood on the mountain slopes, and return in the afternoon, chanting a rather melodious song. They wear massive gold and silver ornaments. According to Monseigneur Biet, once a year a very large caravan arrives from Shi-ga-tze, near the frontier of Sikkim, about 1500

miles west of Ta-tsien-lu. The caravan, which is six months on the road, comes through Southern Tibet, where feed for the large number of horses they bring with them is more readily obtained. They spend a month trading in the town, their chief articles of merchandise being narrow striped woollen cloth, and woollen rugs used for saddle cloths, which they exchange for Ya-chau-fu tea. Very good Tibetan sealing-wax, made from the residue of a Tibetan dye, and which does not melt in the heat, may be purchased in Ta-tsien-lu. The costume of these Tibetans is different from that of the natives of this locality. They wear brown blankets thrown round the shoulders and draped into a sort of skirt, and brown hoods with a red patch in the centre hanging at the back of the head like a monk's cowl. Polygamy and polyandry exist.

Indian rupees have always come into Ta-tsien-lu in great quantities and form the current coin, and of late years the number of Russian roubles has considerably increased.

The mail system is decidedly curious. Official despatches are carried from Lhasa to Peking by a mounted courier who rides day and night; he is tied on to his horse at starting, and at each station he reaches he is untied, lifted off, given a raw egg, and then mounted on another horse which is ready waiting for him. The two soldiers who accompany him are changed at every station. Many of these couriers die on the road. Ta-tsien-lu swarms with Lamas; with their shaven heads and long red cloaks, they look rather picturesque at a distance. A curious description was given me of the burial, if I may so call it, of a very high Lama who died at Batang. The body was carried to a lofty plateau, and there the flesh was cut off the bones and the bones crushed and mixed with a sort of flour, and both were given to the vultures; the whole corpse being thus satisfactorily disposed of.

The Chinese mandarin here was not well disposed towards Europeans, and did not return our visit. On the 26th of July we made a short excursion to a Tibetan village called Chet-tu, about 14 miles west of Ta-tsien-lu, where we slept in a native hut, sharing our room with a happy family of cows, cats, dogs, and pigs. In the beginning of August we camped out in a Tibetan tent, on the mountain, for four days. These tents are made of Chinese cloth embroidered with blue. They are used by the Tibetans in the summer when they go into the mountains, and for a week at a time beside one of the mineral springs in which they bathe. These waters are believed to have wonderful healing properties. Tibetans travelling with brick tea take tents with them. They cover the tea with the tent, tie their dogs up near, and lie down on the ground wrapped in their blankets. During our four days on the mountain we saw quite one hundred *Crossoptilon tibetanum*.

On August 15th we left Ta-tsien-lu, and set out on our return journey to Hankow. We struck the river at Kia Ting on the 29th. The missionaries told us that three weeks before the river had risen 50 feet in one night, inundating the town; and that the loss of life and property had been appalling. A little lower down we anchored at a spot where in May we had passed a populous village; not a vestige of it was left. We heard also from the missionaries that there had been a good deal of talk about our expedition. As an instance of the rumours that are set on foot about Europeans, I may mention that we were accused of catching and eating children; we were also reported to catch snakes so large as to require five men apiece to carry them. Even at I-chang, where Europeans are well known, the wildest stories were circulated about us. Our boat was said to be laden with lions, leopards, and elephants, which we intended to let loose upon the unoffending inhabitants. We reached Hankow on the 29th of September 1889.

The following year, 1890, we made a second expedition to Ta-tsien-lu, to increase our collections. This time we carried out the intention we had formed on our previous journey, of ascending Mount Omei. This mountain is 11,100 feet high, and is regarded throughout the neighbouring countries as a spot of peculiar sanctity. There are between sixty and eighty temples on it, and about two thousand priests, and it is continually visited by many thousands of pilgrims. The mountain rises abruptly like a promontary, and can only be ascended from one side. The others are extremely steep, one of them being a precipice nearly a mile and a third high, the highest sheer declivity, perhaps, in the world.

We left Kia Ting on the 10th of April, slept that night at the town of Omei Hsien, and began the ascent next morning. As we approached the mountain, we passed many fine trees, of the species allied to the banyan. One particularly fine specimen, with a magnificent spread of foliage, I measured and found it to be 30 feet in circumference. The path led us at first through a wide fertile valley of rice fields, with clumps of trees scattered here and there as in a park. The mountain is covered from head to foot with undergrowth and forest, pines, hollies, and other evergreens predominating. On ascending the lowest spurs of the hills, we passed a beautiful pool of clear water (very blue) well stocked with fish. Flowers were very abundant, wild roses, anemones, asters, yellow violets, and two species of hydrangea. Here I noticed *Paxia begonia*, which I believe has no representative in Europe, but which, I believe is represented in America.

Near the top I found a primula and a dwarf azalea with fragrant foliage, the latter, so far as I know, a unique specimen. On our way up we met a Tibetan whom we had known at Ta-tsien-lu the year before; he had travelled all that way, with his wife and two little children, to worship Buddha in a temple half way up the mountain. The

priests, however, in common with all the Chinese, regard the Tibetans as barbarians, and will not allow them to enter the temple, or give them any accommodation; so they had encamped below it and were cooking their food at a fire they had lighted. Wan-nien-ssù, where we spent our first night on Omei, is a delightful spot; the vegetation is particularly fine and semi-tropical in character. The variety of species of large trees here seen is surprising. The mountain is crowned by a temple which stands close to the edge of the great precipice. The present structure is of wood, but the original was of bronze, and tons of bronze slabs with the image of Buddha are still lying on the ground. They appear to be Indian work, and were originally covered with gilt. Some of them have been let into the walls of the wooden building and on those that have been protected from the weather, the gilding still remains. Some of these slabs appear in the photograph. At one of the lower temples we saw a life-size brass elephant. It looked like Indian work, and had probably been cast in sections.

During this visit I more than once witnessed the curious phenomena known as the glory of Buddha. Standing on the edge of the precipice and looking down into the sea of mist which generally fills the valley below, I saw, about 150 feet beneath me, the golden disk surrounded by rainbow-coloured rings of light, which is the chief marvel of Mount Omei, and the clearest evidence of its sanctity. Every year many pilgrims commit suicide by throwing themselves down from this cliff.

Early the following morning I saw the most beautiful sight I ever beheld. The sun was shining brightly, and the atmosphere on the mountain top was perfectly clear; below us lay a level sea of cloud, and perhaps a hundred miles away, as the crow flies, we could see the mountains around Ta-tsien-lu, and the great snowy range of Tibet, rising out of the mist with the brilliant sunshine gleaming on their white peaks.

Leaving Omei-shan we passed through a flat uninteresting rice plain to a market town called Kiah-kiang, where I met the coolies who had been sent on to wait for me there.

We were three days travelling through the Ya valley, crossing the Ya river six times. We passed through Ya-chau-fu, altitude 2570 feet, where the road begins to enter the mountainous river, and reached Tai-Hsiang-Ling-Kuan pass on the 22nd of April, altitude 9270 feet. Five days more of hard climbing brought us to Ta-tsien-lu.

I arranged that Mr. Kricheldorf should go to Moupin, while I had settled to spend some time at Mou-si-mien. For a few days I was very busy despatching my collectors to their different stations, paying off coolies, and arranging boxes and apparatus. On the 1st of May, accompanied by Father Soulié, I made an excursion from Ta-tsien-lu to the snow-capped mountains, and pitched my tent in a forest of rhododendrons just coming into bloom, about two hours below the region of

perpetual snow. By way of summary of the vegetation I may divide the country here briefly into four regions or zones:—

1. Above 16,000 feet we have perpetual snow.
2. Between 16,000 feet and 10,000 feet, rhododendrons, anemones, primulas, rhubarb, many lilies, a few asters, grass, and wild onions; of birds, *Crossoptilon thibetum*, *Lophophorus Lhuysii*, and Père David's small blue bird.
3. From 10,000 feet to 5000 feet—Rhododendrons, coniferous trees, gooseberries, several species of currant (including one very large black currant with bunches of fruit a foot in length), undergrowth, and several species of birds.

4. Below 5000 feet there is cultivation on a few farms, and pasturage.

In the daytime, during our stay on the mountain, it was warm; but the nights were intensely cold, and we kept up a large fire made of the trunks of the rhododendron trees, some of which were quite a foot in diameter. Climbing some 3000 feet above the place where my tent was pitched, we discovered a lovely lake of clear deep-blue water, with a quantity of sulphur lying on its shores. It took us an hour and a half to circumnavigate it. It is walled in by high precipices, and above them is a glacier of solid green ice crowned with snow. It is, no doubt, one of the supply sources of the streamlet which flows through Ta-tsien-lu, and empties its waters into the Tung-ho at Wa-ssü-kow.

While I was here there was a rebellion of the peasants in a district a few days distant from Ta-tsien-lu. Their crops are taxed so heavily by the Lamas that they cannot scrape together enough to live on, and are periodically driven to these desperate attempts to improve their condition. When I went back to Ta-tsien-lu, after two days' camping out, the first things I saw were the heads of the three ringleaders exposed in bamboo cages. I left the town again on the 7th May, and encamped on the south side of the mountain. After conveying all my baggage to an altitude of 14,800 feet, I was not very well pleased to receive a message from the local Tibetan king forbidding me to remain on the mountain, as it is a sacred reservation. I was obliged to return to Ta-tsien-lu, intending to make my way thence to Mou-si-mien, which is beyond the king's territory.

The road to Mou-si-mien passes by the king's palace about four miles from Ta-tsien-lu, and here I met the king returning from a bath in one of the hot natural springs which abound in this locality. He is an old man, in bad health, suffering from cancer. He was dressed in the usual costume of Tibetans of the better class, and was walking under a huge scarlet umbrella, held by one of his numerous attendants, with a pack of hounds at his heels. On seeing me he stopped and entered into conversation with me, my cook acting as interpreter. He was much interested in my gun, and wanted to know how far it would kill. He told me he had never heard of my arrival. I do not know if he was telling

a falsehood, or if my men had invented the message I had received while camping on the mountain. He is very fond of sport, and the forest near his palace is strictly preserved. He has a herd of eight or ten large elk in domestication. He seemed an intelligent, well-informed man, and has visited Peking.

This king is a practically independent chieftain, but sends tribute once in two years to Peking. He is often at loggerheads over questions of jurisdiction with the Chinese official in Ta-tsien-lu. He restricts the Chinese cultivators to certain limits, and will not allow firewood to be gathered in his forest.

He is a wealthy man, his riches consisting chiefly of land, cattle, and horses, and owns several hundred of the last. Once a year he gets up a horse race, which causes a great deal of excitement. The races begin early in the morning, about five or six o'clock. The riders are boys, gaily dressed for the occasion in coloured costumes; they start perhaps a thousand feet or more above Ta-tsien-lu, and race down the steep descent and through the town, tearing down the steep mountain side at a great pace. All the inhabitants turn out and see the sight; the races being one of the great local events of the year. The king gives three prizes. When I was present there were about 100 horses running. The palace is like a Chinese house with a tiled roof. It is built over a natural hot spring, which can be seen issuing from the foundations, and which supplies him with water for his bath.

Two miles farther on I reached a small Tibetan group of hamlets, where I slept in a house owned by his Majesty; it was in fact his dairy farm, and the milk and butter I got were delicious. Like all Tibetan houses it was built of stones, but roofed with split pine shingle, large stones being placed on each piece of shingle to keep it in its place when the wind is high. There are three hot springs issuing from the tops of three yellowish brown conical rocks. These rocks seem to have been formed by the continued incrustations of the minerals contained in the water; they have the appearance of a soft pumice stone. The water is very hot and has a very obnoxious smell, like that of decomposed sea-weed. There is a black slime on the edges of the stream, which flows through the valley, and green aquatic plants grow in the warm water. The king has a wooden bath surrounded by stones, which is filled from one of the springs (issuing from the top of one of the conical rocks) by a bamboo tube.

May 17th, I reached the summit of Mou-si-mien pass, 13,000 feet. There was a little snow and it was bitterly cold, and I saw a good many flowers in bloom. Two were most conspicuous, one an annual bearing a blue blossom; the other a creeping plant covered with small crimson flowers. Every winter lives are lost in this pass, in spite of the poles which are placed at short distances to mark the road; coolies lose their way in what they call the cup or crater. On descending the

other side of the pass, one obtains a delightful panoramic view of the valley, stretching away as far as the eye can reach to the south, towards the village of Mou-si-mien, two days' journey from the summit. At this season the forest of rhododendrons and azaleas was a glorious sight, resembling a sea of bloom; and as one continues to descend the narrow dark forest path, pines of immense growth, oak-trees, several species of beech, larch, limes, walnuts, stunted bamboo, and many evergreens are met with. Most of the vegetation is draped with a kind of lichen of a pea-green colour, which hangs in graceful festoons from the branches of the trees. A quantity of those famous medicines, viz. rhubarb, wolf's-bane (that poisonous plant from which aconite is obtained), Tchöng-Tsão, Péyou (*Sphaeria Sinensis*) and Woularia (*Cirrhusa Streptopus*) is gathered in this locality. The first is a most curious plant, its root exactly resembling a caterpillar, each segment being perceptible. There are also many beautiful flowering annuals. On the mountain side I met about fifty coolies in a hut, most of them Chinese medicine collectors.

I found a path through this primæval forest which clothes the upper part of the pass, and after ascending some distance through the forest it brought me to an abandoned clearing, just the spot for my tent, with a lake close at hand. The climate at this elevation was so damp that I was obliged to build a log cabin to prevent my collections from being impaired. There was a peculiar species of woodpecker bird in this forest and on the lake I saw three large yellow ducks of a kind I have seen on the Yang-tze. I found a very fine onion growing in moist soil at 15,000 feet. After five days on the mountain I heard that my two Wa-ssü-kau collectors had come back to Ta-tsien-lu, and wanted more boxes and a larger cyanide bottle, and I was, therefore, obliged to return to the town. As I descended the pass I noticed a very high conical-shaped mountain standing out conspicuously on the left hand. Going down one constantly comes upon small plateaux covered with rich grass and buttercups. Soon after my return to the log hut the weather became intensely cold, snow fell heavily and the rhododendron blooms were cut off by the frost. It was the beginning of June, but the temperature was like that of a Canadian winter. It was impossible to do any collecting. I had meant to spend a great part of the summer on the mountain, but the superstition of the natives prematurely ended my stay. The unusual severity of the weather was attributed to the fact that a stranger was living in the forest, and a paper signed by all the inhabitants of the village, lying two days below me, was sent by the native chief of Mou-si-mien to the civil mandarin of Ta-tsien-lu, declaring that I had caused the snow and blocked the road, and the hail was destroying their crops; and threatening all sorts of disturbances if I remained. Under these circumstances there was nothing for it but to go. Collecting in this country is not an easy matter. On June 24th, Prince Henri d'Orléans arrived at Ta-tsien-lu with two other Europeans

and an escort. The attitude of the civil mandarin towards the expedition was by no means friendly, and for a few days all the Europeans in the place were anxious how things would go. When I left, about a month later, however, the people seemed more peaceably inclined. Prince Henri was desirous of continuing his journey overland through Yunnan into Tong-king, which he has since accomplished. On July 21st, I left Ta-t sien-lu, arriving at Kia-ting-fu (where I had left my boat) on August 2nd. After revisiting Omie Shan I left Kia-ting on September 4th, arriving in Chung-king on the 8th September, where I was again cordially received by Mr. Cockburn. The journey from Chung-king to I-chang was accomplished in 53 working hours, a distance of 400 miles. Here I was met by kind friends, and considered my journey at an end.

After the reading of the above,

Dr. HENRY (of the Imperial Chinese Customs) made some observations concerning the flora of Western China, where he had himself travelled. He said that on ascending the Yang-tsze, for the first 1000 miles we had the great alluvial plain; then a point is reached where a vast mountainous country begins, which extends westward to the Tibetan-Chinese frontier, and constitutes, in Dr. Henry's opinion, a well-marked botanical region. Indeed, the region might be extended further westward to Khasia and Sikkim; and so far as the nature of the flora is concerned, the Himalayas may be considered to end on the east at the town of I-chang on the Yang-tsze. Our knowledge of the plants of this part of the world has nearly all been acquired within the last few years. Père David was the first to give us any idea of the rich treasures to be met with, by his collections from the Tibetan state of Moupin. Père Delavay for some years has been sending to M. Franchet, of Paris, admirable collections from the mountainous parts of the province of Yun-nan. He (Dr. Henry) was stationed for some years at I-chang, and during the years 1885 to 1888 made excursions into the mountains of Western Hu-peh and Eastern Sz-chuen; and his collections, which were all forwarded to Kew, include several hundred new species and a good many new generic types, besides establishing the fact of the existence in the eastward part of the region of most of the interesting plants that were formerly known from the Himalayas only. Dr. Ernst Faber, of Shanghai, made in 1887 an interesting trip to Mount Omei, and brought back several hundred species of plants, many of them new. These are likewise deposited in the herbarium at Kew. Now we have Mr. Pratt's fine collection, made chiefly in the mountains around Ta-t sien-lu; it contains about 700 species, which are being worked out by Mr. Hemsley, of the Kew Herbarium. The flora of the region in question is perhaps mainly Himalayan in character; but in addition there are very few Japanese plants which do not find a home also in these mountains. We have also, of course, at high elevations, alpine plants; and the flora which is known to extend from Britain eastward through Germany, Russia, and Siberia to Korea, sends southwards to our region many species. For example, the black currant and the gooseberry are common wild shrubs in the mountains of western Hu-peh. Furthermore, there are many local forms, each ravine having almost a little special flora of its own. It has long been known that the flora of Japan exhibits a singular connection with that which prevails in the eastern part of the United States of America. Our region also shows as markedly the same character. The American tulip-tree (*Liriodendron tulipifera*) is quite common in the mountains of Hu-peh. Again, for example, we have such a case as this:

the genus *Decumaria*, a close ally of *Hydrangea*, was formerly constituted by a single species from Carolina. He (Dr. Henry) found a second species growing in the I-chang gorge. There are hundreds of facts of a similar nature; so that when the flora is more thoroughly studied, there will be much light thrown on the important subject of the geographical distribution of plants.

Dr. Henry further spoke of the great beauty of the vegetation of the ravines and mountains of this region. He drew attention to the fact that a great many of the hardy shrubs and plants in cultivation at home are originally from China; and pointed out that there is a great field for enterprising florists in those mountainous provinces of China, for the introduction of many more beautiful and useful plants. Some of these cultivated plants Dr. Henry observed (almost the first time by any one) in the wild state, e.g. the Chinese *Primula*, the Banksia rose, *Rosa indica*, *Rheum officinale*, &c.

The PRESIDENT in conclusion said:—I am certain that you will desire me before the meeting breaks up, to give your very best thanks to Mr. Pratt for his exceptionally interesting paper, and you will include in the expression of your gratitude Dr. Henry, who has made some very interesting observations upon the botany of these regions; but as you know that there is in the next room a very large and valuable collection, such as none of us have, I think, seen before, of objects of interest from these countries, you will wish, I rather think, to adjourn there as soon as possible.

Central Australia.

By CHARLES CHEWINGS.

THE prediction of Sir Roderick Murchison, in 1844, "that a thorough exploration of the interior of Australia will never be effected until we import thither camels, from our eastern possessions, and thus at once get rid of the vast difficulties attending the want of water," has proved true to the letter. From that time to the present the exploration of Australia has been going on, and the receipt of a letter from that great patron of exploration, Sir Thomas Elder, G.C.M.G., while on a visit to his native Scotland, has once again sent the blood tingling through the veins of those whose hearts respond to the calls of science and discovery. Here is the letter:—

"KNOCK CASTLE, AYRSHIRE, July 2nd, 1890.

"My dear Baron VON MUELLER,—I was delighted to receive, and have had much pleasure in carefully perusing your inaugural address to the Australian Association for the Advancement of Science in Melbourne. The paragraph in your address referring to geography has revived the interest which I have always taken in Australian exploration, and as you say, that 'talent, enthusiasm, and experience, are available at present,' I cannot but agree with you that it would almost be a reproach to permit the opportunity to pass for completing what you properly describe as the main work of Australia—land exploration.

"You say that this work in the past has devolved on nine travellers only, and that space seems left now for only one more great explorer to rank with the nine. This being the case, I would like to furnish the tenth exploring expedition; and if you will take up the matter energetically, as you have done on former

occasions, I will hold myself responsible for the funds, so that no unnecessary delay will take place. Everything, of course, will depend on the leader of the expedition and his party, but, being on the spot, and being connected as you are with the various geographical societies, you will have no difficulty, I should think, in helping me to succeed in this scheme. What I would like you to do, my dear Baron, is this, viz. to intimate to the Melbourne exploring and geographical societies, and to other kindred societies in the Australian colonies, that I am willing to bear the whole charge of this proposed final expedition, provided a scheme is formulated and submitted for my approval.

"I have already referred to the importance of finding a thoroughly competent leader, as upon that, much of the success of the expedition will depend. He ought to be a man not merely of pluck, courage, energy, influence over men, and possessed of all the required physical qualities, but of such scientific attainments as will enable him to report advantageously on the topographical, geographical, botanical, geological, and other features of the tracts of land which he may travel over; but I need not expatiate at length on this branch of the subject, as no one knows better than yourself the special qualifications required by the party conducting such an expedition if it is to be thoroughly successful. What I would like you to do is this, viz. to intimate to the Melbourne exploring and geographical societies and to other kindred societies in the Australian colonies, that I am willing to bear the entire cost.

"I hope that in the midst of your important and engrossing pursuits you will be able to help me in the way pointed out. Let a scheme be carefully prepared, in concert with the best experts, for the final important work of Australian land exploring, and transmitted to me, when, if approved, I shall immediately take steps to have the scheme realised at my own charges. Have the goodness to write to me at my present address, and believe me, with ever sincere regard and every good wish, yours sincerely, THOMAS ELDER."

It is not within the limits of this paper to treat on the explorations east of the Barcoo and Cooper's Creek, and Lake Eyre, as almost the whole of that part of Australia has been brought into subjugation, and stocked sheep and cattle runs may be said to embrace the whole. Nor shall the explorations near the coast, on the north, north-west, west, south-west, and south have attention. It is that part of Australia, our knowledge of which has not so rapidly advanced, and which has so frequently baffled explorers to penetrate, to which we purpose exclusively directing our attention.

So vast is the area of unoccupied land in the interior of Australia, that it may be counted by scores of thousands of square miles. Much of the land is admirably adapted for various uses, much more is suited only for pastoral and like pursuits, and comparatively little but that can be turned to profitable account. That this vast area should be occupied and become an asset to the Crown, but few will disagree with; and the question as to how this end can be speedily obtained is of considerable moment.

In the land legislation of the different Australian colonies, and its effect on the back country, we have a precedent to guide us part of the way, but the land treated on in this paper is farther from the settled districts, and the nature of the country and the climatic conditions

differ; stock have to travel longer distances to market, and heavier rates for transport of stores, dearer labour, and many other things, have to be taken into account; but nothing will prove of such advantage and stimulus as to make access to the interior easy by means of a railway, and liberal land laws to induce mankind to stay when there, and make homes there. The trans-continental railway is looked upon by many as a national undertaking, and that the national debt of South Australia shall not become burdensome by a debt so large as a work of such large dimensions would entail, a population should be induced to settle on the land on either side, which is an essential to the line if it is to become remunerative. The idea of the trans-continental line proving a payable investment, I know is scouted by many; but I do not and cannot think but that it can and will, if economically constructed, prove a good investment. Such a vast area of country, with such natural advantages, must, if utilised economically, be able to support a railway running through the centre of it. So far Australia has had development works and railways following; but the order must be reversed, and railways are required to develop successfully the vast interior of Australia.

All Central and Western Australia is, in the main, a huge plain, stretching from the Blue Mountains on the eastern coast to the sea in Western Australia, and from Port Darwin in the north to Eucla in the south. So extensive, indeed, is this huge plain, that, with the exception of a ridge or two on its otherwise level surface, it is the most extensive area, after the desert of Sahara, without running rivers intersecting it, on the face of the globe. Perhaps on no part of the earth's surface could so many sandy ridges be found as in Central and Western Australia. By the action of flood, waters, and wind, and ancient seas—which latter have subsided for a geological age or two—those strata that cover so thickly the American ranges, the Alps, the Himalaya, and other parts of the globe, have been entirely removed from large tracts of Australia, leaving the granite formation on or near the surface. Vast areas also have only a thin coating of desert sandstone (so-called), a recent formation geologically, resting on quartzite and other rock formations. In the vicinity of the Macdonnell Ranges exists a heavier bed of sandstone, which will be mentioned later. How many thousand feet of strata have been removed can only be a matter for conjecture.

Those parts that we designate high land do not range much above 2000 feet above the sea, and the mountain peaks range only from 4000 to 5000 feet. Considerable areas of tableland still exist, but the whole is being rapidly lowered, perhaps more by wind than any other cause, and it is to this agency we must look for the cause of the sandy ridges, called sand hills, that cover such large areas, and make wheel transport so difficult. It absorbs the rain as it falls, fills up the water courses, the flood waters are cut short by it and sink beneath the sand soon

after leaving the ranges. It will be easily understood why so few surface waters exist, and why explorers have found so little water away from the ranges. The annual rainfall averages over this tract of country from 8 to 25 inches, which, were it not for the sand, would supply numerous surface waters.

In the vicinity of the higher lands and the ranges in general, the pastoral prospects are good, and millions of stock can and will be depastured over this great plain in the future; and but few parts are so destitute of feed, provided water is obtained, to prevent stock doing well, particularly those bred in the country. The vegetation covering this land is not semi-tropical, but that of a temperate zone; its growth is not rank—the extremes of temperature are too severe for that. In the early morning ice is not unfrequently seen, and at noon on the same day the thermometer will range over 100 degrees. Notwithstanding, the climate is remarkably healthy, and but little notice need be taken of these rapid changes of temperature, saving the adoption of a light, airy, Oriental costume, and seeking a shady retreat. In the heat of summer manual labour should be suspended in the heat of the day, and so far as possible heavy outdoor work should be done during the winter months. Of the fertility of the soil there can be no doubt, and too much cannot be said of the succulent herbs that grow in profusion after rain. The sandy nature of the soil retains considerable heat and acts like a hotbed, and forces the herbage and grasses to grow after rain very quickly. The soil is sweet, and stock eat almost every kind of vegetation voraciously. Where irrigation can be brought to bear, there is no limit to the growing of fruit, cereals, and vegetables; good fresh water must be used, as proved by the missionaries on the Fynke near the Macdonnell Ranges. For some years the supply of water from a sandy soakage in the creek kept fresh, and everything grew entirely to their satisfaction; but, as more land was irrigated, and the supplies of fresh water were replaced by stronger soakages, more or less brackish, a falling off in the growth was noticed, until a flood replenished the fresh-water supplies.

Amongst the most notable of the early explorers in this country, whose transport and baggage animals were horses, were Captain Sturt, John McDonnell Stuart, Eyre, Giles, and Winnecke. Then comes a new feature in Australian exploration—viz, the introduction of camels. In 1846 a splendidly equipped party, under the leadership of Robert O'Hara Burke, taking only camels as transport animals, penetrated the interior to Stuart's Creek, via the now celebrated Barrier Ranges, made so by the discovery of the Broken Hill Silver Mine, the output from which has been growing and growing, the last week's yield (Aug. 30th, 1890) exceeding 200,000 ounces of silver, not to mention the lead, or the output from other mines along the line of lode.

There has existed in the minds of many the opinion that the loss of

poor Burke and Wills, who were starved to death on their return to Cooper's Creek from the Gulf of Carpentaria, was occasioned to a large extent by a want of knowledge and mismanagement of the expedition, for certain it is that no explorer with camels ought ever to perish in the way they did. But to some the reason is apparent, and it is this: the camel is an animal with an exceedingly sensitive temperament, and while possessing those wonderful powers of endurance that make it so useful in covering long, dry, waterless stages, almost destitute of feed, and on which nothing but a camel can live, it is absolutely necessary that it should receive the kindest treatment, and in trying circumstances the greatest care. The above remarks apply in a tenfold sense when the animal has been but recently imported. It takes from two to three years at least for imported camels to become properly acclimatised, and it was during the early stages of acclimatisation, when partially unfitted for work, and without drivers possessing a practical knowledge of the habits of the camel, that Burke and Wills imposed upon them the inordinately heavy work of exploring the interior of Australia. What wonder that they met with such difficulties; and that in the end the animals, with no heart left in them, pined away and died, and with them their riders?

In 1866 Sir Thomas Elder imported a small shipload of camels, and the decimating that went on during the acclimatisation of this lot fully bears out what has already been said as to their unfitness for hard work for some time after importation. Some six years after Sir Thomas had imported them, he, together with Mr. W. W. Hughes, fitted out an expedition under the command of the late Colonel Warburton, who crossed the continent from Alice Springs to the Oakover river on the north-west coast, through a very dry tract of country, and performed such journeys that if not acclimatised the camels could never have endured the privation. About the same time the late W. C. Gosse did good work with them, and Ernest Giles, when equipped by Sir Thomas Elder with camels, crossed and recrossed the continent, showing that nothing in the way of exploration in Australia was impossible with them. In one instance he travelled the great distance of 325 miles without meeting with water on the way.

Since Giles's journey comparatively little interest has been taken in exploration in Australia, for it was known that nothing stood in the way of crossing the continent in any direction; and it must be borne in mind that any part of the interior can be reached by the aid of those animals destined to play a part in Australian development little dreamt of as yet. The camel, the Bedouin life, and the great plain of Central Australia, are all well adapted to each other; and at the northern end of the southern portion of the trans-continental line one can now see Oriental life in Afghans, camels, and tents, as truly as in Arabia or Western Asia. The crossing of Australia on camel-back is as easy to

this Bedouin people as train-riding or coaching is to Europeans, and were it not that the Afghans are unlikely to prove good colonists, they could be of use in bringing this immense area of land into subjection. The area of sandy land suitable also for ostrich-farming is unlimited, and, as proved by the farm at Port Augusta, the industry can be made financially a success. Date palms, I feel sure, will do well, and an effort is being made to plant them around the springs in the Lake Eyre artesian basin. Far inland, unless rich mineral discoveries are made, the pastoral will be the premier industry; but even this is likely to have a severe check, if not annihilation, for while stock can be bred in any numbers, the matter of getting them to market is not nearly so easy.

The class of country over which the proposed railway will run, in comparison with that of Sahara—or that over which the Trans-Caspian Railway passes, as shown by the able paper read by the Hon. G. Curzon before this Society some time since—stands out in bold relief as a tract of land well adapted for occupation, and no great extent can be called a desert in the strict sense of the term. Its geological advantages are immense. There is no doubt in my own mind that where one flowing water exists now, in years to come there will be thousands.

In the far distant geological ages Australia lay beneath the sea; a slow, general uplifting ensued, and afterwards the heated plastic matter forced its way upward, gradually cooled under great pressure, and took on the form of granite, either as subaerial or subaqueous. This high land in turn suffered degradation to such an extent that the primary superstructure was entirely removed over large areas, leaving granite exposed. While heat lasted, the granite and other plutonic rocks metamorphosed adjacent strata, into the crevices of which a variety of minerals found their way in solution; an instance we have in the newly discovered Yilyarre Goldfield, reported so favourably on by H. P. Woodward, Government Geologist of Western Australia. During some period of activity, lateral pressure concentrated its efforts, and pushed very gradually the elongated dome-shaped mass upward until the earth's crust gave way, and into the cracks and fissures thus formed, igneous plastic matter found its way in the form of diorite dikes, that now form in parallel ridges the main backbone of the present Macdonnell Ranges. Whether the trap dikes that are seen to interstratify the quartzite formation that flanks the Macdonnell Ranges for miles on either side was formed at the same time and in the same way, or whether it is a subaqueous volcanic deposit that overflowed at intervals during the formation of the quartzite strata, is a question. Mr. Woodward reports that a large area of basaltic rock underlies the upper strata of the north-western coast, and stretches away inland towards the Macdonnell Ranges, underneath probably the highest continuous table-land in

Australia. If the trap dikes are volcanic rock, no traces of the locality in which the volcanoes existed have as yet been found, but as a speculation we may suggest the head of the Finke river. The diorite dikes are heavy, and run throughout the entire chain of mountains, and must have had largely to do with the Macdonnell upheaval, if not, as Mr. J. J. East, of the Adelaide School of Mines, thinks, with lifting Central Australia into dry land.

Of their local action there can be no doubt, and great metamorphism ensued on either side for miles. Whether all this went on above or beneath the sea matters little. The point of greatest interest is, whether or no the metamorphism is of that class in which mineral veins, deposits, and precious stones occur. On this point we have the affirmative answer of the Government geologist of South Australia, Mr. H. Y. L. Brown; and, better still, the proof positive in the discoveries at the ruby fields, and the Hale river goldfields, both being situated in the Macdonnell Ranges.

Mr. Brown classes the rocks at Hale river as argillaceous, micaceous, sandstone, and granite, with quartz reefs. In his report to the South Australian Government he wrote, "15 or 20 reef claims were shown me; in all, or nearly all, fine gold could be seen on breaking the stone, and on crushing and washing the quartz similar gold was always visible."

The country rock is gneissic, granite, micaceous, slate, and sandstone, diorite, apatite, sienite, &c., similar to those of the Barrier Ranges in which the famous Broken Hill Mine is situated, and are likely to contain both silver and copper bearing lodes. Mr. Brown further suggested that the reefs in other parts of the ranges should be prospected, and writes, "Those reefs already discovered would doubtless pay if machinery was in the district. The rocks are favourable for rubies and other gems of a similar composition."

The so-called Australian rubies are an entirely new class of stone, of considerable brilliancy when cut, harder than a garnet, and a cross apparently between that stone and a ruby. Recently stones found in the same district have been submitted to London experts, and proved to be diamonds.

Near to the ruby fields, deposits of mica were found a year or two ago, but recently, on the opposite side of the range, large and valuable deposits of mica are reported to have been discovered, and a ton or two is now on its way to Adelaide. The sheets are said to be large and beautifully transparent. The same class of rocks have been traced throughout the entire length of the range—some 350 miles; and taking outliers into account, another 200 miles can be added to that. For many miles to the north and north-east of the main chain the crystalline rocks crop up, and there is room for very much prospecting. The South Australian Government have under consideration the

thorough prospecting, combined with a geological survey and examination of the ranges, which it is estimated will cost not less than 10,000*l.* and extend over 12 months; the work will be carried out by travelling caravans of men and camels at the direction of the Government geologist. In each caravan or party one man will be capable of fixing sights for trials, with a knowledge of minerals, and be able to decide by blow pipe analysis the value and character of any discoveries made.

While the metamorphosing process was at work the mineral-bearing strata were either exposed to the atmosphere or the sea; they were then overlaid in all probability by layers of different rocks, many thousands of feet thick, which have since been removed from the cap of the ridge by erosion. Prior to, or perhaps while the erosion was going on above, the diorite dikes already referred to were cooling into an excessively hard and durable rock, on which time has played its ravages with far less effect than on the metamorphosed rocks on either side of it.

Another rock, quartzite by name, one of the outer layers of strata that formed the mass, is also a hard and durable rock. The Macdonnell Ranges are frequently described as "long, parallel ranges, alternating with long, parallel plains more or less undulating and rocky." The cause is found in the two adamantine rock formations. Weathering removed the top of the range quite away, leaving the metamorphic rocks exposed; being softer than either, the quartzite ridges of rocks on the outer sides and the ridges of diorite running parallel through the heart of the range, were eroded much faster, and were carried away to lower levels by flood waters through narrow and deep gaps or gorges in the diorite and quartzite ridges, leaving the very rocks most sought after well exposed.

Long after the first upheavals or periods in which the mountains were formed, and great degradation had taken place, ancient seas swept over most, if not the whole of Central Australia. At that time the upper part of the Macdonnell Ranges was an island, or, in Mr. Brown's words, "at least above water"; the seas deposited a thick layer of dark-red sandstone over many, and perhaps the whole of those inclined and scarped projections of quartzite that, as before mentioned, flank the Macdonnell Ranges in receding steppes for many miles, being the remnant of the first upheavals. The highest parts of the Macdonnells are in the vicinity of the heaviest diorite dykes.

In the western part of the James Ranges very heavy diorite dykes occur, and scarped quartzite projections, with dip south, and strike east and west, are frequent in occurrence; in fact, it is in these ranges the sandstone formation can be best read. The Government geologist is now making a tour through them, and his report is looked forward to with interest.

The layer of dark-red sandstone (the deposit of this later date, and which Mr. Brown supposes from their appearance to be of Devonian age, and in which no fossils have as yet been discovered) was deposited, as just now stated, over these diorite peaks and ridges to a depth of from 400 to 1000 feet, or perhaps even a much greater thickness. Large tracts of waterworn boulders lie on the top of many of the quartzite ridges, giving additional proof that the sea level was below the higher peaks. This is more noticeable to the south of Mount Zeil than anywhere else known at present. This dark-red sandstone formation is particularly interesting because it does not conform to the older strata beds of rock, and for reasons given hereafter.

Lying on the top of the quartzite of the Macdonnell Ranges and other ranges, and underneath the sandstone, but conforming to the quartzite and underlying the whole, probably, of the Lake Eyre basin, there is a thick bed of limestone, crystalline in structure, contorted in appearance, and forming in all probability the channel down along which those copious supplies of water find their way.

That a general upheaval was going on very slowly and the waters gradually subsiding, is very likely the solution of many watermarks showing on the precipitous sides of this red sandstone formation, which is yearly becoming less. Wherever it is seen, it has the same characteristics; precipitous sides in the upper parts, often quite to the level of creek beds or surrounding country; absolutely impassable as a barrier, except through the creek channels, where it towers to 600, 700, and 800 feet, at an angle of 90°. As a rule, this formation has been separated from the scarped quartzite ridges and diorite dykes by infiltration. Being less durable than the quartzite, it has been carried by flood water to lower levels. Thus in many parts of the James Range we have alternate ranges of quartzite and red sandstone, both from 600 to 800 feet above the narrow plains; the quartzite is scarped, and dipping south; the sandstone horizontal and precipitous; and where watermarks appear on the concave sides of parts of the red sandstone ridges, a striking resemblance to that of the seats of an amphitheatre, that dwarf the famous wreck in Rome into insignificance, is seen.

Apparently a gentle upheaval went on after this formation was deposited, and compensation effected the enormous depression in which Lake Eyre is the lowest and last receptacle of flood waters and débris, which feature will have attention a little later on.

During the period of time now under consideration, being long antecedent to the depositing of the red sandstone series, the seas swept over this vast tract of land, and around the island Macdonnell. As the land rose, it did so unequally and faster in the vicinity of the Macdonnell and James Ranges than in other localities; and while, in the James Ranges particularly, we have hundreds of square miles of this red sandstone, and an isolated range or two on the Palmer and Finke rivers

and other places of the same formation, yet it is everywhere apparent that what remains is a particle only of the whole—the balance was lapped away by receding seas, of which the watermarks along the mountain sides is the standing evidence.

At what period or periods the Lake Eyre depression was formed has not yet been satisfactorily decided, but we may fairly conjecture that an opening at one time existed to the south into Spencer's Gulf. During cretaceous times, however, that and all other outlets were things of the past, and the detritus from the Macdonnell and James Ranges, as well as many other high lands, was washed into this large basin, of which, so far as ascertained at present, the outline extends from the coast range, situated a little south of the Gulf of Carpentaria, westward, nearly to the overland telegraph line. It then runs south-east towards Lake Eyre, and, skirting the Macdonnell Ranges elevation, curves round to the north of the Charlotte Waters telegraph station in about the latitude of Lake Amadeus, which lake it approaches, if not includes. This is probably the western boundary of this system.

Whether another and separate system exists west of Lake Amadeus remains to be proved; it is quite within the bounds of reason and probability that another and separate water-bearing system of large extent does exist to the west of Lake Amadeus, bounded on the west by the coast range; the north boundary is problematical, as is the south. From Lake Amadeus the Lake Eyre system extends south-easterly towards Port Augusta, takes a curve to the eastward, and runs along east and west a few miles to the south of Lake Eyre. It then makes south-easterly for the Barrier, and taking a long sweep to the east and north embraces the extent of those rivers that flow from south of the Gulf of Carpentaria into Lake Eyre. The shape is semicircular, and crescent-shaped, extending towards a half moon. No doubt detritus from the extensive area covered by the already mentioned red sandstone formation contributed largely towards filling it up to a level much higher than the present level of the country; this is easily seen by the numerous tent hills and table lands scattered throughout the area of the basin, ranging from 200 to 500 feet high, of which Chambers's pillar is a remnant. As the basin sank, or surrounding land became elevated, so the flood waters carried this newer cretaceous formation to the lowest depression, cutting deep gullies and wide waterways through the newer deposits, and generally lowering the basin. This has been going on probably from time immemorial; certainly from cretaceous (secondary) age, down through tertiary and quaternary ages to the present time. When the seas that washed the softer and newer deposits away from the Macdonnell Ranges and laid bare much of the primary rocks had subsided, and Central Australia was elevated quite above sea-level, and long ages of scorching summers had evaporated its larger lakes and surface waters, and the cretaceous age (during which Lake Eyre was

an inland sea) was rapidly becoming a thing of the past, a newer influence, and one that exists to-day—viz., that of wind—probably blew into all secluded and rock-bound spots, depressions, shallow lakes, and like places, the sandy weatherings of the rocks from around their base, and a newer formation was the result. This is the commonly called "desert sandstone," for what reason I have never had a satisfactory explanation. In other parts of Australia, possibly, a different sandstone may have the same appellation, but I am now confining myself particularly to the central boss in the centre of Australia and the most recent sandstone upon it. Both as a shallow water deposit and a dry wind-blown deposit, it retains its unmistakable characteristics. Its colour is that of an ordinary grindstone, and it consists of horizontal layers, the cap of each being harder than that underneath it. By weathering, its sides get hollowed out; and in the caves thus formed, the aborigines find a refuge from the extremes of the weather, often painting devices on the walls. No doubt this formation exists over a large area, but from personal observation I cannot point to any one place where for many miles at a stretch it appears continuously. In such secluded spots as Ernest Giles's Glen Edith, where the Palmer issues from the James Ranges, at the head of the Petermann, and similar secluded spots, it may be seen. The largest patch I remember noticing was in Bagot's Creek on George Gill's Range, where it is impounded within an ancient rock basin. I am inclined to think that in the lower parts of the flood-water channels nature's workshop is turning out this article at the present day.

The great extremes of heat and cold, a dry atmosphere, and strong winds caused through radiation, tend to constant degradation of the rocks, the detritus being blown into sand hills and distributed throughout this large area. In Western Australia along the line of route taken by the Hon. John Forrest, Surveyor-General of Western Australia, in lat. 26° S., a sandstone is met with that covers all other rocks from E. long. 122° to E. long. $126^{\circ}30'$. In this extensive area of "desert sandstone," all the rising ground is composed of it. "Very often one side of the rise forms a cliff." This was the formation that defeated the late Mr. W. C. Gosse and Mr. Ernest Giles in 1873, and compelled them to retreat when making for the head of the Murchison river. Further to the north the late Colonel Warburton found this same sandstone formation taxed his camels to the utmost, and he barely succeeded in crossing to the western coast with his life and those of his party—so scarce did he find surface water in this formation. In the eastern colonies a desert sandstone exists, but whether similar to that in Western Australia, I cannot say. The sandstone of Gosse, Giles, and Warburton, is probably like that of the Saharian sandstone of tertiary and quaternary date, and is the upper layers of strata that have been sometimes forming, sometimes disintegrating since the mesozoic age. Mr. Woodward

has satisfied himself that this formation overlies most, if not the whole of the western coast formations from Cambridge Gulf to King's Sound, and that it extends far inland towards Central Australia.

Under this sandstone formation the carboniferous series he describes as well developed, and if it continues right across the continent, as it does in China, coal deposits may yet be found in the interior of Australia. He has also discovered a large lava flow in the north-west, and fixes the Leopold Range as of carboniferous age; also that the coast of Western Australia is rising rapidly, and he describes the sandstone area as extending inland "as a vast table-land of from 1000 to 2000 feet above sea-level. No volcanoes exist in the colony of Western Australia, and the general appearance of the country throughout indicates a condition of remarkable quiescence continuing even further back than the carboniferous epoch." He describes the rivers, for the most part, as "simply immense storm-water channels. Several large rivers have their sources in the western edge of this plateau, and cutting deep gorges through their upper horizontally-bedded rocks, expose the underlying crystalline rocks across the strike of which they have cut their channels," and considers that "precious stones may be found in the amygdaloid regions. The mineral-bearing districts have been greatly decomposed and altered by thermal waters and steam at the time of the deposition of the lodes, and later by the heat evolved by the oxidation of the metallic sulphides." He corroborates the opinion that the uppermost, or "desert sandstone, is of terrestrial origin," "and probably formed shortly after the elevation of this continent. In places, these beds are of terrestrial origin there is not the slightest doubt; in other places the indications point to a swampy or lacustrine source."

Mr. Woodward has travelled over a large part of Western Australia, particularly near the coast, and he also made a lengthened trip into Central Australia, chiefly over the Lake Eyre basin; and he has had the especial advantage of examining this so-called desert sandstone formation, to the disintegration of which we attribute those endless sand-hills that have been so often described as a desert, but which cannot be strictly speaking so called—because a desert grows no vegetation, while this sandy land is covered, often very thickly, with trees and shrubs. He is of opinion that "a great deal of work is done, vastly altering the appearance of the country, by what may appear to many people at first sight a perfectly ridiculous agency—viz., the white ants; but after passing over the plains or through the thickets, where their hills are so numerous that it is difficult to drive amongst them, the immense amount of their work can be better appreciated. The clay is cemented with resinous matter, with which they build their nests, is as hard as a brick, and when these fall to pieces they form clay flats almost impervious to water, and so hard that they will bear a great deal of traffic without being

out up. The work of these insects can be studied in all stages: first, in the thickets where they are commencing work; then in the more open country, where they have got the upper hand of the timber; next on the plains, where half the hills will be found deserted; and lastly, on the clay flats, where they have almost entirely disappeared, and the scrub has begun to grow again. Another remarkable thing about these nests is the amount of iron they contain, for when a tree has been burnt in which they have built a nest, there will be found at its base a mass of iron clinker, looking just as if it had come out of a furnace."

I am inclined to the opinion that the sandstone formation is so porous that rain and flood water is quickly absorbed by the loose sand of the sand hills and flats, and quickly sinks away through the bed of sandstone underneath, and is lost. No doubt the sand-hills and flats retain a deal of moisture, or vegetation would not exist, nor would the Eucalyptus grow so luxuriantly on the tops of them to a diameter of 2 or 3 feet; but it is the porous sandstone allowing the water to leak away that makes the areas covered by it so scarce in surface waters.

We have now come to that stage, through a wearisome detailed description of the rock formations of Central Australia, to a land flowing, so to speak, with milk and honey. It will have been observed that the quartzite, the limestone, and, if old enough, sandstone formations, flanking the Macdonnell Ranges, dip to the south, whereas the later formations lie horizontally and unconformably on them. The uplifting of Central Australia created a boss, and we have also surmised that compensating influences effected the Lake Eyre depression, which so far as we now know, is partially filled by cretaceous clays with a thin capping of tertiary and quaternary deposit. The clay is impervious to water, but the older inclined strata that dip away from the central Australian boss, as well as the encircling ranges around it, are not. By the sandy nature of the soil in the higher lands, the precious drops of rain, just now said to be lost, are caught and prevented from running into the sea, or large salt depressions; the water thus caught gradually filters down along the inclined strata, underneath the clay, and while the surface of the earth is dry and parched, under that clay deposit there exists one of the largest artesian water-bearing systems on the face of the globe. Throughout the Lake Eyre basin vast stony table-lands are found; these stones are supposed by Mr. J. J. East to be the porcelainised cappings of the once more elevated bed of this inland sea, which by the action of flood-waters has been undermined and broken into fragments. It is a singular coincidence that pebbles of an even size should be so thickly strewn and evenly distributed over thousands of square miles of country. The gibbers, as the stones are frequently called, are, as a rule, found on the slightly elevated lands throughout the basin, while

the sand-hills occupy the depressions. Both amongst the sand-hills and on the table-land natural artesian springs are numerous in places, or districts; those in the southern part of the system have the largest number, but those existing farther to the north throw out immense supplies and as a rule better water. Some waters are strongly impregnated with saline matter, but as a rule good for stock and man, while many are sweet and soft, and suitable for irrigation and domestic purposes. The largest batch of springs (for I may say they occur in batches as a rule) yet discovered is that of Dalhousie springs, situated a little south of east from the Charlotte Waters telegraph station. These springs, like most others, frequently take on the form of an inverted basin or cone, from 10 to 14 feet above the surrounding country, being the deposit of travertin from the spring water. The succession of mounds runs for 10 miles in length, and a considerable width, and the flow of water as it accumulates forms a small river and runs out into a swamp and is lost. Were it conserved and carried away in pipes, thousands of acres could be irrigated by it. The waters are fresh, tepid, and good for human consumption and irrigation.

Latterly the South Australian Government have tapped the supplies on the southern edge of the system with the diamond drill at an average depth of about 400 feet through the bed of cretaceous clay and boulders with great success—in two wells the supply exceeds a million gallons each per diem, while in Queensland similar success has attended their efforts. Apparently there is no limit to the supplies obtainable. The system in fact extends over and drains upwards of 472,000 square miles. Mr. Charles Winnecke, F.R.G.S., whose extensive detailed explorations have taken him over such a large portion of Central Australia, and to whom I am indebted for great assistance in compiling this paper and comparing notes, assures me that the telegraph line from the centre of the continent to Port Darwin runs along a low ridge and forms the north-western boundary of the system which was the portion least known to me, and he would extend the system even further in that direction than I have mapped it. In most parts the line of demarcation is traceable approximately by the watersheds.

It may be interesting if we look at the intrinsic value of the tract of land under consideration. In the first place, it is on the whole a good pastoral country; some of it, such as that on the Herbert, Diamantina, and other rivers, is considered to be amongst the very best in Australia, and the famous Mitchell and other grasses that clothe it are so well known as to need no other remark than to say that hundreds of thousands, if not millions, of stock are depasturing there at the present time. Much of the southern portion is stocked with sheep and cattle, and as a horse-breeding country cannot be excelled in the world. As further water supplies are obtained the pastoral industry must increase. This, as may be said of the whole of Central Australia, is

admirably adapted for the camel. The Australian-bred animal is much preferred to the imported—on account of being better fed, it grows to a better and stronger animal.

All the main lines of railways of development are making towards this great basin, and it is largely from this district that the export trade in frozen and tinned meats, which advances steadily year by year, must look for its supplies. It was remarked, when Russia annexed the Caspian Sea districts, that she had annexed a "barren and costly acquisition;" but the recent development in the petroleum trade has been so prodigious as to alter the title to the "Black California." I make this remark because Central Australia has been spoken of so frequently and described as "useless," that a comparison between it and other parts of the world somewhat similar in outward appearance may develop similar internal resources. A recent discovery of kerosine shale has been made to the east of Lake Eyre at a spot called Mount Hogarth. An assay from the sample brought to Adelaide and assayed by Mr. G. C. McMurtry, of Adelaide School of Mines, gave the following result: Moisture, 0.268; volatile, 83.200; fixed carbon, 7.764; ash, 8.768; sulphur, nil; specific gravity, 1.111; which speaks for itself. When lit, the shale burns with a clear light; and on the light being extinguished a smell of kerosine is noticeable. The same piece whilst being tested exploded, owing to the large quantity of gas contained in it. This shale resembles that of Hartley Vale Shale Mine in New South Wales, which is stated to have yielded 150 gallons of crude oil to the ton, and 18,000 cubic feet of gas. Small seams of brown coal have been discovered close by, and it is quite possible, by tapping the district with a diamond drill, petroleum wells may be found.

What the possibilities are by irrigation remains to be proved. A precedent may be found in the interior of the Sahara. The Hon. G. W. Cotton was instrumental in obtaining the following information on this subject:—

"The following particulars relating to the utilisation of the artesian and other waters in the desert of Sahara, in Algeria, have been selected from five papers obtained by the Government of South Australia through the British Government from the Government of France, which very courteously sent out two pamphlets, being extracts from *La Revue Scientifique*, one dated 1887 and the other 1888, written by M. G. Rolland, the French engineer in charge of the works in Sahara, also a report by the same author written for the Paris Exhibition of last year, with two papers in *La Nature* for February and March, 1889.

"In the desert of Sahara, the Oued Rir', of which the capital is Toungourt, is a large district of the vast region of Africa, formerly known as a trackless waste of drifting sand. This portion of Sahara is now discovered to be really endowed with artesian waters. It is here that remarkable works of boring have been executed since the French

conquest, and, thanks to the good effects of irrigation, they have wrought a veritable transformation.

"In thirty years the oases have been increased in value five times over, and by the development of their natural resources the population of the district has largely increased. . . .

"The date palm, *Phoenix dactylifera*, which constitutes the wealth of the Saharian oases, produces fruit, with proper care and regular irrigation, in five years—sometimes in three years—after it has been planted, but it is not till it is eight years old that it is in full bearing. It produces best from the tenth to the sixtieth year, and lives to over 100. Without this palm tree the Sahara would be everywhere a desert, and it is there only that the fruit ripens properly. It supports the extremes of temperature of the Saharian climate—nocturnal cold, dry, and transient, six degrees below freezing point not being hurtful to it, and the heat never being too great for the fruit. But more important than the heat is the dryness of the atmosphere. This last is indispensable to produce sweet and luscious dates. The neighbourhood of the sea is fatal to it; on the southern coast of the Mediterranean the dates are comparatively worthless, not having either sweetness or flavour. The palm trees grow in the poorest soils, impregnated with gypsum or a considerable amount of salt. As for the fine variety, known as 'deglet nour,' it flourishes in soils the poorest, the most sandy and stony, and with even a fair percentage of salt in it.

"The date is for the Sahara what wheat is for Europe and rice for India. It is the usual food of those who live there, the chief article of consumption and exchange for populations of millions; moreover, it is food fairly scarce and very much in demand in its own country, and it is not to be supposed that it will to any appreciable extent come down in price, although there may be a considerable increase in production. A sure and remunerative market will always be found on the spot. Nowadays the fine date is exported in considerable quantities, principally to Marseilles, whence it is sent to numerous countries. Its consumption is on the increase in Europe, and it will be more in demand when this nutritious fruit is better known. It is very difficult to estimate accurately the profit of the palm tree one year with another, as the regularity of production depends largely on the care given and the species planted.

"A 'deglet nour' palm tree has been mentioned in the garden of M. Colombo, which, in a favourable year, had borne a crop worth 2*l*. It is not an uncommon occurrence for a good date palm to be exchanged for a camel, the latter being worth more than 12*l*. On the other hand, a garden planted with common varieties, and badly irrigated, will not return 1*s*. per tree. The average yield may be reckoned at 4*s*. per tree, which, at eighty trees to the acre, makes 16*l*., as elsewhere stated. Dates are valued at 1½*d*. a pound on the spot. One extensive district

has 900,000 palm trees, and more than 500 fruit trees grown under the shade of the palm trees. . . .

"Under the shadow of the palm tree other productions may be grown, which without this shade it would be impossible to grow were they exposed to the burning sun. In this way the inhabitants cultivate cereals—barley, sorghum, maize, &c.; vegetables—red pepper, beans, melons, water-melons, &c.; fruit trees—the fig, pomegranate, apricot, olive, vine, &c.; fodder plants—such as lucerne, madder, &c.; also tobacco. The long silk-cotton grows extremely well in some of the oases. In the Sahara the ostrich is famous for its beauty, and in the value of its plumage is without rival. . . .

"In addition to the artesian wells, dams should be constructed according to the modern science of the engineer, namely, dams at the foot of gorges descending from the hills; also cheaply constructed dams at the foot of each catchment area. Later on the locomotive will supplant the camel, because the transport costs three times less than camel carriage.

"The magnificent basin of artesian waters which forms the riches of the interior, is far from having given the output of which it is capable, or its full productive power for vegetation and providing support for human life. There is nothing to prevent these borings being profitably continued, in case that they are under competent supervision. . . . But it must not be thought that the whole Saharian desert can be transformed into a cultivable region by boring and the planting of date palms. It is only in these oases, naturally among the poorest on the globe, that, by means of the date palm and of the artesian waters, we possess elements of wealth which can only be found in territories the most fertile and the most favoured by nature and climate.

"Planting an acre of palms at the rate of 10 per cent. annual profit creates a capitalised value of 160*l*. The outlay on first establishing and working the plantations, I estimate at 80*l*, i.e., when carried out on a large scale. The planting 50,000 palm trees, as the Batna and South Algerian Company has done, means creating a value of 100,000*l*. Doubling the number of palm trees in Oued Rir', as I have said we hope to do by creating new oases far from existing ones, means a value of 1,200,000*l*. . . .

"Every oasis must occupy ground that admits of irrigation, or at any rate presents sufficient humidity. It is a difficult matter to give exactly the quantity of water necessary for an acre, so that the palm trees may prosper. The custom, when a sufficient quantity of water is available, is to irrigate the gardens, copiously flooding the soil to a depth of about three inches. To do this, the ground is divided into sections by trenches, into which the water is conducted. The water is managed so that each part of the plantation may receive water at regular intervals varying from five to ten days, i.e., under ordinary conditions, and for well-grown palms.

"The principal thing is to give water at intervals short enough for the subsoil to preserve a certain moistness necessary to vegetation in the quick evaporation of the Saharian climate.

"Now at eighty trees per acre, an average watering of half a pint per tree per minute equals for a whole year a volume of water of about 420 cubic feet per acre. It is an important thing that oases well irrigated should be well drained by means of trenches; stagnant water is fatal to the palm tree. It must be applied frequently if artificial, or water running naturally. It may be mentioned that water in the shape of rain is not beneficial to palm trees, for, although they require water at the root, they demand an intense solar heat and extremely dry air for the purpose of ripening their fruit. Rain is very injurious, particularly in spring, and in autumn before the crop is gathered. The waters of some sources are lukewarm or slightly mineral, with a temperature of 66° to 86° Fahrenheit, and even reaching 94° at one source. Although slightly saline, these waters are soft and drinkable. They hold in solution dry salts varying up to 45 oz. per gallon of water.

"The king of wells in Oued Rir' was sunk in 1884; it delivers 1333 gallons per minute. Another well sunk in 1887 turns out 888 gallons per minute, and equals the finest artesian well in Paris, at Passy. Similar supplies are not rare at Oued Rir'; the wells of 660 to 880 gallons are fairly numerous. The 'behour' means a considerable lake of limpid water that one is surprised to meet with in these dried-up regions.

"As stated before, the irrigation of the desert may be considerably augmented by constructing dams or reservoirs in the most convenient spots, which would allow of conserving a large volume of water when the waters flow down the hills after rain.

"There are now 43 oases in one district, with nearly 520,000 palm trees in bearing—more than 140,000 from one to seven years old—and about 100,000 other varieties of fruit trees.

"There are as many different kinds of palm trees and dates in the Sahara as there are varieties of pears and apples among us. The fine transparent date, called 'deglet nour,' is an unequalled variety, whose value is much greater than that of the others; besides, this fine variety is comparatively rare in the Sahara, and its quality also varies much in different localities, according to natural conditions of climate, soil, or irrigation, just like our French wines. The African dates are coarse, some better than others, and, as there is no wine in the world to equal the Bordeaux and Burgundy wines, in like manner, to find really fine, sweet, luscious dates, one must go to the portion of the province of Constantine and Tunis which lies the nearest the equator.

"The other varieties of dates may be divided into two great classes—the soft dates, which are pressed in goatskins and which one sees being sold in the Arab markets, and the dried dates, which do not stick

together, several handfuls being put for the day's food in the 'burnous' of the traveller. These common dates are, as a rule, consumed by the inhabitants who are too poor, except in the towns, to be able to afford the fine dates. . . .

"The lowest quantity of dry salts per gallon in the water of l'Oued Rir' is given as .57 oz. per gallon; the maximum at 1.07 oz. per gallon. The Conservator of Water, Mr. J. W. Jones, gives the artesian water at Hergott as containing .29 oz. of salts; at Strangways Springs .91 oz.; at Coward Springs .62 oz. So that the water in Sahara is more strongly impregnated with solid matter in solution than in these three bores situated in the most saline part of the Lake Eyre basin."

It will be seen at once what a great field for enterprise and industry, and what room for settling a large population there is in Central Australia; and the reason why it has not progressed more rapidly is because its capabilities are so little known. South Australia in 1872 completed the overland telegraph line from Adelaide to Port Darwin, a great work for a small colony, but it has brought the old and the new world into hourly communication. For some years a projected trans-continental railway has been added to by extensions from Port Darwin and Adelaide towards the centre of the continent, and it is variously estimated that it will take from five to ten million pounds sterling to complete the line. Such a large sum of money would involve too heavy a national debt per head of the population, it is thought, and on different occasions a movement has been started to have it constructed on the land grant principle, which proposal has raised two more:—(1) If the railway were constructed by a syndicate or company, would that company want a guarantee of interest on the capital expended for a number of years? or (2) would the railway be handed over in exchange for land, as sections, or the whole, were completed?

The idea of parting with the land is distasteful to some, while the settling of a large population on the land obtained by the company, by which its value would accrue, would prove of greater benefit to the colony than the land as it now stands idle.

While these wranglings are going on, Queensland is pushing out her railways, and two of her lines are more than half-way to the western boundary of that province. New South Wales proposes extending her railways either from Bourke or Tay to Broken Hill; South Australia proposes extending a line from Farina to Innamincka, which will be convenient for New South Wales to join on to from the Barrier; an extension to the north, and the Queensland railways can be joined and extended to the Herbert River Junction. The apathy with which the Northern Territory has been treated by South Australia must sooner or later result in a petition to the Home Government for separation, and if successful, the newly fledged Northern Territory will have no difficulty in borrowing the money to complete the alternate and more easterly

trans-continental railway, that will then connect the very splendid harbour of Port Darwin in a fairly direct line with Queensland, New South Wales, Victoria, and South Australia, the advantages of which must be apparent to all, bringing, as it will, the Australian Colonies into closer communication with old England by several days' travel.

Such is a brief outline of Central Australia and its prospects. The idea of a desert must be dismissed, for there are very few spots that cannot be turned to some useful account. While those industries that loom large in the future have been briefly touched on, very many industries besides are being tried, and will yet prove suitable to this newest of England's colonies—that promises, if fairly and honourably treated, to form one unit in the Empire of Greater Britain, and the sun-burnt subjects who dwell there, judged of mentally, morally, and physically, we trust her Most Gracious Majesty may not be ashamed to own.

ADELAIDE, 26th Sept. 1890.

GEOGRAPHICAL NOTES.

Dr. Jameson's Journey through Gaza-land, from Mtassa's to Gungunhama's Kraal, near the mouth of the Limpopo.—We have just received from Sir John Willoughby a copy of a valuable map showing the route of Dr. Jameson and his party on their recent journey through the Gaza country. Sir John writes to Mr. Coles, our Map Curator,—“I am sending by this mail two copies of a map compiled by Dr. Jameson, comprising the route taken by him on the wonderful journey of 740 miles he has recently made from Umtali near Mtassa's in Manica, to Gangunhama's kraal near the Limpopo river. Dr. Jameson travelled with Messrs. Moodie and Doyle, and nineteen Kafirs. A great part of the country travelled through was uninhabited, and the party had to live on a handful of mealies most of the time. For a distance of at least 150 miles the route lay through swamps, and the journey was undertaken at the worst time of year, the rainy season. With the exception of a little fever, Dr. Jameson got through all right, but Moodie and Doyle suffered severely from fever.” We hope soon to be able to publish the map, with a narrative of the journey.

Major Hobday's Expedition.—A letter dated 27th February has been received at the headquarters of the Survey of India, from Major J. R. Hobday, who is with the expedition up the higher Irawadi, giving some interesting information of his travels. Leaving Bhamo on the 22nd of December, 1890, the expedition proceeded to Senbo by steamer, and thence marched up the right bank of the Irawadi as far as the confluence of the two main branches, the Mali-kha and the Mè-kha. From this point the party followed the right bank of the Mali-kha, or

western branch, as far as latitude $26^{\circ} 15'$, which point was reached on the 15th January, and they were prevented from proceeding further northwards. On the 17th January the expedition turned back and, proceeding by a slightly different route across the angle formed by the Mali-kha and Mè-kha, crossed the latter at a point about 20 miles above their confluence, and finally arrived at Maingna on the left bank of the Irawadi, opposite Myitkyina, on 1st February. On the 5th the expedition started on another trip in a north-easterly direction, and after marching for four days up the valley of the Mè-kha, turned southwards. Major Hobday concludes his letter as follows:—"I am afraid we have not done much towards finding the sources of the Irawadi. We took the volumes of the two branches, the Mali-kha or western, and the Mè-kha or eastern branch, at the confluence, and we made the latter somewhat greater than the western branch; the water was also colder. At the point we crossed the Mè-kha, 20 miles above the confluence, where the river was in pools, we got an extreme depth of 93 feet. I have practically settled the basin or area of the Mali-kha, and from the difference in volume of the two rivers, I am inclined to conclude that the eastern has not a much longer course than the western, so that the Lu-kiang from Tibet will, I fancy, be found to be identical with the Salween. There are many other facts which point to this conclusion, such as the small amount of drainage that falls into the Salween from the west. However, nothing definite about the Lu-kiang could be ascertained, as beyond the point we reached on the Mè-kha you get amongst Maroos and Yaw-Yins—wild tribes about which we know very little."—About 2000 square miles of rough reconnaissance work has been executed by Mr. F. Kitchen and Sub-Surveyor Ikbaluddin, in the Baungshe country, Upper Burma.

The Survey of Japan.—Considerable progress is being made by the Government of Japan in their survey operations. A map on the scale of 1:200,000 was commenced sixteen years ago, and is now published (in 77 sheets) for the whole of the islands, except Yezo. This is, however, considered merely as a provisional publication, being based on Japanese methods of work, and therefore not to be relied on for accuracy. A modern survey was commenced eleven years ago, with triangulation of four orders, and depending on some five base-lines. Copperplate photogravure and lithography are employed in the reproduction of these maps, and few if any Europeans are employed. The work appears to be excellent. Only a small proportion is completed, and it will be many years before the whole is finished. About 300 of the published sheets can now be bought; the scale is 1:20,000. A map on a scale of 1:100,000 is also being prepared, based on the 1:20,000 map; no sheets are yet for sale. The names on these maps are in Japanese characters. In the Geological Survey of Japan reconnaissance map, Roman characters are used; 1:400,000 is the scale.

Great Australian Expedition for completing the Exploration of the Interior.—We learn by the recent mail that the important expedition equipped by the liberality of Sir Thomas Elder, G.C.M.G., the munificent supporter of so many former undertakings for the thorough exploration of the remaining blanks on the map of Australia, was on April 22nd fully organised and ready to start from Adelaide. The leader is the well-known Australian explorer Mr. David Lindsay, whose admirable qualifications for so responsible a post may be seen by his paper on his journey across Australia in 1885-86, and accompanying map, published in our 'Proceedings' for 1889, p. 650. The second in command is Mr. F. W. Leech, of Adelaide. The other members are Mr. L. A. Wells, surveyor; Dr. F. J. Elliott, medical officer and photographer; Mr. V. Streich, geologist; Mr. R. Helms, favourably known as an able and zealous natural history collector; and Messrs. R. G. Ramsay, A. P. Gwynne, C. A. Bowden, and A. Warren, assistants. Forty-four camels with their Afghan drivers, four in number, and a native guide also form part of the expedition. The areas to be explored lie nearly all to the west of the overland telegraph line; the first reached will be that lying between the tracks of Gosse, Forest, and Giles, and is stated to be a tract some 1300 miles in length by 300 to 350 miles in width; the next is a strip lying between the northern track of Giles and Colonel Warburton's route, roughly estimated to be 900 miles in length and 200 in width; a third blank lies in the Northern Territory to the east of the country explored by Warburton in 1873, Gregory in 1856, and Forest in 1879, a "patch" of some 400 miles by 300 miles, lying between the overland telegraph line and the Victoria river. The return journey will be to the east of the overland telegraph. The expedition excites wide-spread interest in the Australian colonies, the other branches of the Geographical Society of Australia co-operating with that of Adelaide in the arrangements, and a great harvest of results in the various departments of science is anticipated.

REPORT OF THE EVENING MEETINGS, SESSION 1890-1.

Tenth Meeting, 27th April, 1891.—The Right Hon. Sir M. E. GRANT DUFF, G.C.S.I., &c., President, in the Chair.

PRESENTATIONS.—*Lieut. B. L. Sclater, R.E.; Rev. E. R. Sill.*

ELECTIONS.—*Capt. Henry Charles Edward Cave (Bombay Staff Corps); Michael Doherty, Esq., B.A.; Willoughby Gardner, Esq.; Herbert Large, Esq.; Alfred Tudor MacDermott, Esq., B.A.; John Stein Morrison, Esq.; Charles Deane Oliver, Esq., C.E., B.A.; Capt. W. G. Stairs (late R.E.).*

The paper read was:—

"Our Present Knowledge of the Himalayas." By Colonel H. C. B. Tanner, Indian Staff Corps.

The paper was illustrated by a series of views taken from photographs and from Colonel Tanner's drawings, shown on the screen by the dioptric lantern. A large collection of Colonel Tanner's drawings in monochrome of Himalayan scenery was displayed after the meeting, in the Examination Room.

Eleventh Meeting, 11th May, 1891.—FRANCIS GALTON, Esq., F.R.S.,
Vice-President, in the Chair.

ELECTIONS.—*James S. Burroughs, Esq.; Charles J. R. Fraser, Esq.; Sir Alfred C. Lyall, K.C.B., K.C.S.I., D.C.L.; Colonel William Larkins-Walker (Retired Madras Cavalry); J. W. Mathews, Esq., M.D.; John H. Parker, Esq.; William Alfred Prince, Esq.; Thomas Rhodes, Esq.; Rev. J. Crossby Roberts.*

The paper read was:—

"The Benue and its Northern Tributary, the Kibbe." By Major C. M. Macdonald, H.M. Commissioner and Consul-General, West Africa.

The paper was illustrated by a fine series of views displayed on the screen, from photographs of the scenery and people taken by Colonel Macdonald and his companion Captain Ferryman. After the meeting, a conversazione was held in the Examination Room, where the large collection of objects of native art collected by Major Macdonald were displayed.

PROCEEDINGS OF FOREIGN SOCIETIES.

Geographical Society of Paris.—March 20th, 1891: Vice-Admiral VIGNES in the Chair.

INTERIOR OF NORTHERN TIERRA DEL FUEGO.

The Minister of Public Instruction communicated a report by MM. Rousson and Willems upon their scientific mission to Tierra del Fuego. The region explored by them is comprised within 52° 30' and 53° 30' S. lat., and 68° 15' and 70° 30' W. long. This part of the country is traversed by a chain of mountains running from Cape Bogueron, where it rises abruptly to over 1650 feet, to Cape Espiritu-Santo. Great lagoons, forming small rivers, extend into the immense plains; the watercourses are very numerous, but many of them are dried up in the summer. The Rio del Oro, which is the most important stream of the northern part of the island, empties itself into the Bay of Felipe. The climate is very variable, according to the locality. The travellers did not suffer from cold at all during their journeys, but two men were frozen to death at Porvenir. However, the climate is not so rigorous as supposed. The lowest temperature recorded by the travellers was 43° (Fahr.), and the maximum 69°; the nights are always very cold. Winds are very frequent, the most violent being those from the west, which attain a velocity of 70 miles an hour. During the three most rigorous months of the year, only six days of rain and two of snow were registered, but on the higher hills much more snow fell; the winter was stated by the natives to have been exceptionally mild. The Indians inhabiting the north of the island are the Onas. They are very tall, and sometimes attain over 6½ feet in height. Their skin is copper-coloured and oily; their face is oval, forehead narrow, and their long hair falls down over their shoulders. Their eyes are small, and eyebrows well defined; nose slightly aquiline, cheek-bones prominent, mouth very large, with small yellowish teeth. They are very muscular and strong, and are great warriors, being continually in conflict with the Indians of the west and south.

It is an error to suppose that they are cannibals, or that they burn their corpses. Several places were found where the Indians had buried their dead. They believe in a spirit whom they call "Waliche," and to whom they refer all good and evil. The north of Tierra del Fuego is completely destitute of trees. The only shrubs found there are the calafate, the romorille, and the mata-nigra. Quadrupeds are few in number, but birds of all kinds plentiful. Magnetic iron can be obtained in all parts in great quantity; gold is also found at some points, but often at very great depths. The native population of the north may be estimated at not more than 300. The whole mainland north of the Straits of Magellan, which ten or twelve years ago was unoccupied, has in recent years become covered with small farms, where sheep and horned cattle are reared; these farms have prospered to such an extent that the vast region they occupy is even now too small. The cordillera of the Andes bars any extension towards Chili, so that it may be concluded that the archipelago of Tierra del Fuego will, in the near future, receive the overflow of Patagonia. There is already on the island a model farm where nearly 20,000 sheep and over 6000 horned cattle are reared.

EXPLORATION IN THE DUTCH EAST INDIES.

The Chairman intimated the presence at the meeting of M. M. Bedot, who had returned from a scientific voyage to Borneo and the Dutch Indies, undertaken in company with M. Camille Pictet. The two travellers also visited Java and the neighbouring islands, and spent some months at Amboina, in the Moluccas, where the marine fauna was specially studied. Their zoological and ethnological collections are of very considerable value.

EXPEDITIONS TO THE PENINSULA OF KOLA.

M. Charles Rabot presented, on behalf of the authors, accounts of two important expeditions, undertaken by Finland naturalists, into the eastern part of the Kola peninsula, which has hitherto been completely unknown. The authors are MM. Kihlman, Palmen, and Ramsay, of the University of Helsingfors. The first expedition, that of 1887, was composed of MM. Enwald and Palmen, zoologists; Brothers and Kihlman, botanists; Ramsay, geologist; Petrelius, topographer; and two others. Three of the party explored the peninsula of the Pêcheurs, on the northern coast, while the others proceeded overland to Voroninsk, and thence to the Lujavr, in the centre of the Kola Peninsula. MM. Kihlman and Ramsay then returned to Voroninsk, and journeyed thence to Jokonsk, near Sviatoïnos, across an absolutely unknown region, while MM. Palmen and Petrelius travelled from the Lujavr to the river of Ponoï, which they descended to its mouth in the White Sea. The expedition thus succeeded in crossing the peninsula from east to west at two different points, a feat not previously accomplished. In the spring of 1889, M. Kihlman crossed the peninsula for the third time, from Lake Imandra to Ponoï. The results of these journeys are considerable. The co-ordinates of eight points on the Lujavr and in the valley of Ponoï were determined, and the map of this part of Russian Lapland has been completely re-cast. On the eastern bank of the Lujavr, the expedition discovered Lujavr-Urt, an important mountain, the culminating peak of which attains a height of 3670 feet. Further to the east stretches a lofty and gently undulating plateau, cut by large valleys radiating from the Lujavr. The geological maps indicate the existence round Ponoï of sedimentary formations, which were supposed to be Devonian, although no fossil had been discovered. M. Ramsay states that these regions are not so extensive as supposed; they are simply isolated fragments formed by sandstones and schists. The botanical studies of M. Kihlman yielded valuable results, and will be continued this summer by the exploration of the Khibinska tundra, which MM. Petrelius and Ramsay propose to make.

— March 23rd, 1891: M. DE QUATREFAGES, of the Institute, President of the Society, in the Chair.—This was a special meeting, held in the large hall of the Sorbonne, to receive Dr. L. Catat and MM. C. Maistre and G. Foucart on their return from their scientific mission to Madagascar. A large number of distinguished men occupied the platform.

DR. CATAT'S EXPLORATION OF MADAGASCAR.

It was in November 1888 that Dr. Catat, together with MM. Maistre and Foucart, were entrusted by the Minister of Public Instruction with a scientific mission to Madagascar, the object being to elucidate certain geographical points and to complete our general knowledge of the great island and its people. The party arrived at Antananarivo, from Tamatave, about the middle of March 1889. Some time was spent in short excursions from the capital on to the high table-lands of Imerina and into the northern part of the island; after this M. Foucart was attacked by fever and returned to France. In August 1889, what is known as the "Radama" route from the plateau of Imerina to Tamatave, was explored. This route, stated to have been traversed in 1820 by King Radama, was found to be much worse, instead of better, than the ordinary way. Extensive marshes, impenetrable forests, deep ravines, and the precipitous slopes of the Ambohitra Kolahy were among the difficulties encountered. It took 23 days to reach the coast by this route, as against six by the usual road. Before returning to the capital, Dr. Catat made an excursion across the island through the forest of Antongil and by way of Mandritsara and Belalitra to Mojanga on the west coast, whence he regained Antananarivo along the valleys of the Betsiboka and the Ikopa. The third and principal journey undertaken by the two travellers had for its object the exploration of the southern part of the island, which was but little known, and where travelling was reported to be dangerous. After considerable preparations, the party set out on the 24th of May from Fianarantsoa for Ihosy, the last Hova post towards the south. From there it was their intention to survey the eastern part of the basin of the Onilahy, then cross over the watershed of the Indian Ocean slope, traverse the valley of the Mandara, and thence to reach Fort Dauphin. It was on the 8th June that the caravan finally left Ihosy for the unknown south. The route lay through the desert of Horombe, which occupies a high and somewhat undulating plateau. Backed on the east by the water divide, this plateau gives rise to numerous streams, which form the right-bank tributaries of the Onilahy. It is covered in places with tall grasses, but otherwise the arid, stony soil is absolutely sterile. No trace of a habitation was found. After five days' march this inhospitable desert was crossed and the village of Betroky reached. On the way a number of Bara warriors threatened hostilities, but happily there was no conflict. The Bara occupy a large tract of country to the west, south-west, and south of Betsileo. Those to the west, who have intermingled with the Sakalava, and those of the south-west, own the sway of King Votra, who resides near Isalo; they live in more or less amicable relations with the Hovas, but quarrel and fight among themselves. With deserters and runaway slaves they form those bands of robbers who, under the name of Fahavala, devastate the Betsileo country. The Bara of the south are under the dominion of King Sambo of Ivobibe, and are even more jealous of their independence, having only very rarely any intercourse with neighbouring peoples. In the vicinity of Betroky, which lies in a large plain some miles east of the Onilahy, the country is more populated, and shows some rude attempts at cultivation. South of Betroky an important geographical discovery was made. It was supposed that the Onilahy, the lower course of which was thoroughly explored by M. Grandidier, took its rise near Ihosy, on the western slope of the Isalo range, flowed directly south, and then at

23° 30' S. lat. turned sharply to the west and emptied itself into the Bay of St. Augustine. It has now been ascertained that the Onilahy rises among the Emigrant Antanosy, more than 100 miles further south than hitherto supposed; it then flows north in a large curve and regains Mantaora, the point determined by Grandidier in 1867. Ascending the right bank of the Onilahy, the travellers arrived at its sources on the 17th June, near the village of Tamotamo. The country traversed differs little in its general aspect from the district round Ihosy. Isolated trees, bushes and brushwood in the valleys, tall grass on the mountain slopes, frequent marshes and bogs in the secluded valleys. A dense Bara population inhabits the numerous villages. Half a day's march to the west lies Tsivory, a village of the Emigrant Antanosy, where a halt was made for a week. The Antanosy are numerous; intermingled with the primitive race and solidly established in the country, they possess large herds of oxen. They cultivate excellent rice, and travel down to the west coast to exchange their products for European commodities. They are called "emigrants," because they have left their country of Anosy in order to escape from the domination of the Hovas. The travellers, after having had several interviews with the King of Tsivory, one of the most important monarchs of the country, returned to Tamotamo. This village is inhabited by the Manambia, who occupy the country to the south. On 28th June the party quitted Tamotamo, crossed the Mandrare, and three days later arrived at the mountains of Beampingarata, which give rise to the Mandrare. This region is partly wooded; the vegetation is very fine. Among the trees the *bolona* which had not been met with before, resembles the African baobab; several specimens measured over three feet in diameter. Other strange plants, not known to the travellers, and the large spaces covered with giant cacti, all contributed to give this country a somewhat unique appearance. The travellers then entered the great forest of Beampingarata, which covers the flanks and summits of the lofty chain forming the eastern limit of the basin of the Mandrare, and soon afterwards arrived in the beautiful valley of Ambolo, and later on at the banks of the Manampanihy. This valley, with its forests of ebony and rosewood trees, its orange groves, plantations, black and fertile soil, countless streams, rivers and hot springs, made a profound impression on the travellers. The population is dense. It is composed of the Antanosy, called here Antambolo. They are peaceable and very superstitious. Traces of the Arab type were observed in many individuals, especially among the chiefs. On the 5th July, after having crossed the second belt of forests and the littoral zone, the party arrived at Fort Dauphin. The latter place is the original home of the Antanosy, who are here a finer race than their relations in the north. The region of Fort Dauphin is remarkable for the many evidences which still exist of the old French occupation. In addition to the remains of various works, walls, and fortification, it is to be noted that a large number of the natives use the French language in ordinary conversation. This district is certainly one of the most fertile in Madagascar; the ancient descriptions of Flacourt and of Mandan are very accurate. On the 30th July the expedition left Fort Dauphin and proceeded along the east coast, which resembles in general that of the north of the island. The village of Manantema, at the mouth of the Manampanihy, is an important one; the river can be ascended in a canoe for a long distance, and is much used by the natives as a means of communication. Further north the village of Manambondro, with over 400 huts, is situated on an island of a river of the same name, which at that point measures nearly a mile in breadth. On the 11th August, Vaingaindrano, the first Hova station north of Fort Dauphin, was reached. Ascending the right bank of the river Mananara, the travellers entered the country of the Antaisaka, which has been completely disafforested. It is well populated, and the large

villages, occupying each summit, are surrounded by rice and other plantations. The Antaisaka resemble most strongly the Bara and the Tanala. They possess many customs evidently of Arab origin, and also some which are analogous to those of peoples in the north-west of the island. They did their best to place difficulties in the way of the expedition. The Mananara is navigable for several hours above Vaingaindrano, but higher up its course is obstructed by sandbanks and rocks. At certain points it forms great lakes and marshes, studded with islands, on which the natives have constructed their villages. On the 20th August the party camped at the foot of Mount Ivohibe, which borders on the south the great plateaus and terminates the central range, and at the end of the month arrived again at Fiamarantsoa. The itinerary of the travellers, about 5000 miles in length, including 1875 miles of entirely new ground, was surveyed throughout with the compass. Numerous points were astronomically determined. The anthropological, ethnographical, botanical, and other collections are very valuable.

—— April 3rd, 1891: Vice-Admiral VIGNES in the Chair.

CAPTAIN MONTEIL'S JOURNEY TO LAKE CHAD.

According to a letter, dated from Segou-Sikoro on 22nd December, 1890, Captain Monteil was on the point of leaving Segou on his projected expedition to Lake Chad. The town of Say will be his first objective. He forwarded a series of observations for latitude, which he had made between Kita and Segou, and also some latitudes calculated by Lieut. Hourst, who is in command of the Niger flotilla, and who has surveyed the course of the Niger from Bamaku to Kurussa, and that of the Tankisso from Sigouri to Tumania.—Communications were made by the following:—by M. E. Blanc, on his journey in Central Asia, which was not one of exploration; by M. Rogozinski, on his travels, in company with his wife, in West Africa; and by M. Foa, on his explorations in Dahomey.

—— April 17th, 1891: M. de QUATREFAGES, of the Institute, in the Chair.—This was the first general meeting of the year 1891. The medals and prizes for the year were distributed to those to whom they had been awarded, and whose names had already been announced.—M. E. Blanc announced the result of the election for the Bureau of the Society for 1891-92, which was as follows:—President, M. de Quatrefages, of the Institute; Vice-Presidents, MM. Antoine d'Abbadie and Émile Levasseur, of the Institute; Scrutineers, MM. V. Turquan and M. Dubois; Secretary, Dr. L. Catat.

Geographical Society of Berlin.—April 11th, 1891.

THE BONIN ISLANDS.

Dr. O. WARBURG read a report upon a journey to the Bonin and Vulcano Islands, which he undertook in company with an expedition sent by the Japanese Government. The Bonin Islands derive their name from the Japanese Munin-fo, i. e. "uninhabited islands." The Japanese also call them Ogasawara shima, after Ogasawara, the supposed discoverer of the islands, a Japanese nobleman, who in 1593 was cast on these desert islands, and who prepared a map of them, and took possession of them on behalf of the Japanese Government. But it was the Spaniards who, in 1543, first discovered some of the islands of this group, and named them. In 1639, they were again "discovered" and named by the Dutch. Three Japanese from Nagasaki visited the group in the year 1675, and prepared a fairly recognisable description of them, which Klaproth has published. Later on the islands were used temporarily by the Government as convict colonies. In 1823 a whaler discovered the southern group of the Bonin Islands, which was named after him Coffin Island. In 1827 the islands were

visited by the English *Blossom* Expedition under Beechey, who took possession of them in the name of England; and in 1828 by the Russian expedition under Lütke, who found there two shipwrecked sailors belonging to a whaler, who had lived there for two years "à la Robinson Crusoe." In 1830 the group was, with the support of the English Consul at the Sandwich Islands, settled with colonists of all nationalities, who, without paying any regard to the English annexation, proceeded to make their own laws to the best of their ability as seamen and South Sea islanders. The visit of the English warship *Raleigh*, under Captain Quin, in 1837, effected no change in the situation. Perry, the leader of the American expedition to Japan, took possession of the southern group in the name of the United States, as it was likely to become an important coaling station between Shanghai and San Francisco. On the closing of Japan to foreigners, the Bonin Islands quickly lost the importance which they had for a short time gained, and they were consequently left to themselves. Then Japan, after an interval of a century, directed her attention to the group, and in 1861 despatched thither a hundred Japanese colonists. But in 1863 this attempt at colonisation, which was of too bureaucratic a character, was given up. In the middle of the seventies the islands were again visited by Russian, English, American, Japanese and German warships. In 1876 Japan took possession of the group definitely, and commenced a fresh and energetic scheme of colonisation. In 1881-3 the islands were surveyed, a map on the scale of 1:10,000 was prepared, and the last census showed a population of 355. The islands are subject to the governor of Tokio, and it was a tour of inspection undertaken by the latter which afforded Dr. Warburg the opportunity of visiting the Bonin Islands. First of all a visit was paid to Miyakeshima, the largest of the Chichido or "Seven Islands" group, an active volcano, as its name "burning mountain" signifies, the last eruption of which took place in 1884. This island, which in some parts attains an elevation of 2700 feet, is covered with bush and forest; it is four nautical miles in diameter, and there are about 4000 Japanese, grouped in five villages, living upon it. The prevailing rock formation is andesite, in which there appears a new description of rock, a compound of manganangite and andesite, called after the island "miyakite." The inhabitants live principally on sweet potatoes, millet, barley, and taro. Box-trees are much cultivated, and the wood is exported to Tokio for manufacture into ladies' combs. The vegetation is entirely Japanese. Somewhat different in this respect is the Hachijo group, a volcanic island, formed by two volcanoes which have not shown any activity for the last 300 or 400 years, with a small plain lying between them. It was originally settled with convicts two hundred years ago, and many old customs have been preserved here. The women are reckoned, according to the Japanese standard, to be especially beautiful. Silk stuffs, dyed with peculiar vegetable colours, form a much-prized article of export. The animal and vegetable world is poorer than that of Miyakeshima. At certain places along the shore there are gigantic walls, composed of fragments of andesite, which are used as bulwarks to protect the houses against the violent storms. The precipitous character of the shores prevents fishing. St. Peter, or Ponafidin, called by the Japanese Torishima ("bird island"), lies 160 nautical miles to the south. It is also an old volcano (1200 feet), with traces of an ancient crater, which is now quite cool. The island is completely uninhabited, but is covered with albatrosses, for which it is a great breeding place. Between this island and the northern part of the Bonin group, viz. the Perry group, consisting of three larger and some smaller islands, there is a clear space of 180 nautical miles, broken only by one small, sharp rock, called Lot's Wife, which, under-wasted by the violence of the waves, rears its solitary crest above the sea. Of the Perry group, only the middle island, Mukoshima, is inhabited by some Japanese. The second group, Kater Island or Kagatashima, is unin-

habited. The third group is the most important, and is for the most part inhabited. Stapleton Island, or Ototoshima, which lies in the north of the group, is inhabited, and so is Peel Island or Chichishima ("mother island"), lying in the extreme south. The latter has an area of about eight square miles, and possesses hills from 1000 to 1200 feet in height. The middle island, Buckland Island, or Ahishima, serves only as a pasture ground for numerous cattle and goats. Peel Island possesses in Port Lloyd an excellent anchorage from 18 to 20 feet in depth. The interior of the harbour is enclosed by coral reefs. The vegetation has even here quite a southern character; clumps of fan-palms rear their heads between the leaves of the bush which covers the steep slopes. The coast swarms at certain seasons with sharks and turtles, and their capture forms the most important branch of industry of the inhabitants. The turtles usually visit the island in January or March, and remain till August; at any rate, the females do so, the spawning period lasting from May till August. Sharks, which usually leave these regions in the winter, are, on account of their fins which are exported to Japan, eagerly sought for, and are caught with hooks. Oil is also extracted from them. A shark yields from five to thirty-seven gallons of oil. The inhabitants of the Bonin Islands are celebrated as otter-hunters. In former times American schooners used to call and carry them to the hunting grounds, but they now perform their journey to the northern parts of the Pacific from Yokohama or Hakodate; they are also excellent seal-hunters. The number of pure Europeans in the group is now reduced to two; these are two formerly German sailors. The number of half-breeds has greatly increased, owing to the large number of births and to the healthy climate, which, being free from fever, conduces to longevity. The women all come from the Sandwich Islands, the Ladrões, Kingman, Marshall Islands, and Japan; the men are Americans, Englishmen, Germans, Frenchmen, Spaniards, Italians, Portuguese, Mulattoes from the Bermudas, Tagals from Manilla, and Polynesians. That out of this strange and confused mixture of races—a woman has often had five husbands, and not infrequently several at one time—the formation of a characteristic mixed race has been impossible, is natural; in spite of that, however, there exists a certain unity of customs and mode of life. The colloquial language is a kind of Americanised English. Scarcely any one can read and write properly, but the children of the few well-to-do persons are sent away to boarding-school at Yokohama. Neither a priest nor a church exists in the islands. If one reads the description which Bayard Taylor gave in 1853 of the ruggedness and inaccessibility of the islands, of the wild character of the vegetation, &c., and compares with it the little low Japanese villages, the great pine-apple and banana plantations, the fields of sugar-cane, maize, taro, and sweet potatoes, as well as the immense plantations of a species of indigo (*Strobilanthes flaccidifolius*) from South China, the cultivation of which is in the hands of a Japanese company and is becoming of great importance, one cannot fail to recognise the great revolution which Japanese colonisation has produced here. The time when a few people could revel here in abundance and idleness has gone; the indolent life of the Polynesian-European mixed race must gradually disappear as agriculture takes the place of hunting and desultory fishing as a means of livelihood. What is now taking place in this respect in the Bonin Islands will also come to pass in other beautiful pearls of the South Seas. Sulphur Island, the position of which was determined by Gore and King, the companions of Cook, in 1779, but which had been discovered earlier by the Spaniards, was found by the traveller to be very nearly bare, just as the old description states. A precipitous volcano (644 feet high), surrounded by rocky fragments, lies on the south side; the sulphur deposits would not pay for working. Water was not found on the island; it is inhabited by boobies (*sula*) and albatrosses. Just as at one time, when the number of endemic species of animals was overestimated,

the Bonin Islands were considered to be a kind of centre of creation, so the botanical studies of Dr. Warburg prove that there are purely oceanic islands of more recent origin which have not, and could not, preserve ancient types of any sort. Any organisms they possess which have not been introduced by man, consist of fragments of the neighbouring floras and faunas, either in original or in slightly altered forms. About one-half of the plant-forms belong to tropical circles of affinity; nearly all from Polynesia and the Malayan Archipelago; the other and smaller half belong to subtropical forms, of which hardly one can be exclusively referred to Japan. That there are so few purely Japanese plants found on the Bonin Islands is explained by the fact that the Kuroshio between these islands and Japan passes away to the north-east, and so divides both regions sharply from each other.

NEW GEOGRAPHICAL PUBLICATIONS.

(By J. SCOTT KELTIE, *Librarian* R.G.S.)

EUROPE.

Thornton, Bertram.—The Comparative Climatology of London and the Chief English Health Resorts. London, H. K. Lewis, 1891: cr. 8vo., pp. 15, map.

ASIA.

Gulbenkian, Calouste S.—La Péninsule d'Apchéron et le Pétrole Russe.—*Revue des Deux Mondes*, 15 mai 1891, pp. 356-97. Paris, 8vo.

[**Palestine.**].—*Bibliotheca Geographica Palaestinae*. Chronologisches Verzeichniss der auf die Geographie des Heiligen Landes bezüglichen Literatur von 333 bis 1878, und Versuch einer Cartographie. Herausgegeben von Reinold Röhricht. Mit Unterstützung der Gesellschaft für Erdkunde zu Berlin. Berlin, Reuter's Verlagsbuchhandlung, 1890: 8vo., pp. xx. and 742. [Presented by the Author.]

Herr Röhricht's bibliography of Palestine is a monument of industry. In a short introduction he indicates what has been already done in this direction, and at the same time gives a copious list of the sources from which he derives his information. He seems to have overlooked nothing of any importance. Besides addenda, there are 3515 entries, many of which include references to several separate publications. Under Cartography there are 747 additional references. The ample indices render the book easy of consultation. The utility of such a work to the student is evident; it would add no doubt to its usefulness if Herr Röhricht would bring the bibliography down from 1878 to the present date; during these years many important additions have been made to the literature and cartography of Palestine.

AFRICA.

Casati, [Major] Gaetano.—Ten Years in Equatoria, and the return with Emin Pasha. Translated from the original Italian manuscript by the Hon. Mrs. J. Randolph Clay, assisted by Mr. I. Walter Savage Landor. 2 vols. London & New York, F. Warne & Co., 1891: 8vo., pp. (vol. i.) xxi. and 376; (vol. ii.) xv. and 347. Price 2l. 2s.

These two volumes embody the results of Major Casati's ten years' observations in Equatorial Africa. The style and arrangement of the narrative can hardly be said to be satisfactory; there is a great want of continuity which may be in a great measure due to the fact that Major Casati lost most of his notes on the occasion of his captivity by King Chua, and was therefore obliged to trust to memory for much of the information he supplies.

Major Casati went out in 1879 to Gessi Pasha who at that time was engaged in a vigorous campaign against the rebel slave traders under Solyman. Shortly after their meeting in August 1880, Gessi was invited to go to Khartoum to confer with the new governor, General Raouf Pasha. Hardly had he gone before the then peaceful state of things was succeeded by disorder and intrigue, which required all possible skill on the part of the young Italian officer to surmount. From this time forward, Casati carried on the work of overthrowing the slave traders, proceeding first to Rumbek and through the country of the Dongu, then through Tangasi to the Makua. Having narrowly escaped with his life from King Azanga's country, Casati fled to the river Welle, where he devoted some time to studying the surrounding country. From here, in response to an invitation, he joined Emin at Lado. After this came the Mahdi revolt and subsequent fall of the Equatorial Province, which is treated of at some length.

Vol. ii. contains an account of Casati's experiences while entrusted with a mission from Emin to Kabba Rega, King of Unyoro, with a chapter on the geography of the region between the Albert and Victoria Lakes, and another dealing with the geography of the Albert Nyanza, the remaining chapters describing the journey to the coast in company with Emin. Although adding but little to the knowledge already possessed by Schweinfurth and Junker on this particular region of Africa, Major Casati's narrative is of considerable interest and importance to the geographer, the anthropologist, and the geologist. The chapters dealing with the Akka pigmies and other tribes encountered are of interest. Although Major Casati is a friend of Emin, the impression left upon the reader as to Emin's character and the condition of his province is much the same as that conveyed by the narratives of Mr. Stanley and Mr. Jephson.

The Appendices consist of Meteorological Observations in Mambettu; Comparative Tables of Native Languages, and Meteorological Observations in Unyoro. The volumes are profusely illustrated, and there are four maps, as follows:—map of the Nile-Congo water-parting; map of the eastern portion of the river Makua and its affluents; map of the eastern watershed of the Kibali-Makua-Welle and Obangi; and map of the return journey from the Albert Nyanza to the Indian Ocean.

Holub, Dr. Emil.—*Von der Capstadt ins Land der Maschukulumbe. Reisen im südlichen Afrika in den Jahren 1883–87.* Wien, 1890: vol. i., pp. xiv. and 564; vol. ii., pp. xiv. and 564; 205 woodcuts and two maps. Dedicated to H.M. Joseph I. Price 18s.

This is the narrative of the Austrian expedition to Southern Africa. When Dr. Holub returned to Europe in 1879 from Cape Town he formed the resolution to revisit that continent and complete his investigations into its Natural History and Ethnology. The particular regions he had then in view to explore were the native kingdom of Marutse and Albertland so named by him, both lying on the Central Zambezi. He also contemplated extending his travels to Lake Bangweolo and perhaps tracing a new white line across the face of the "dark" continent from south to north. The course of events in South Africa meanwhile had taken an unfavourable turn for him. New men and a new policy presided at the seat of government, so that the path he had hoped to find smoothed for him was beset with difficulties. These however were at length sufficiently overcome to enable a start to be made, and in June 1889 the expedition, consisting of Dr. Holub, his wife and six servants (of the Austrian army ambulance corps) left Colesberg, the terminal station in those days of the South African railroad. Their baggage and supplies were transported in three bullock waggons, and a fourth carried an iron pontoon in three sections, brought for the purpose of crossing rivers, the author having suffered irreparable loss on his former expedition by the sinking of a boat with all his valuable collections and note-books. Having crossed the Orange river by one of the four bridges which now span that stream, they entered the Orange Free State. Here they found a welcome change after the revolting scenes of daily occurrence between Cape Town and the Orange river owing to the infamous liquor traffic with the

natives. Much to its honour the Free State had passed a law forbidding under heavy penalties the sale of intoxicants to the blacks. "God bless you," fervently exclaims our author, "for this noble act of humanity!"

Several months were passed in trekking through the Orange Free State and the Transvaal Republic, frequent halts being made at the farms of hospitable Boers. On entering the last named state a telegram reached Dr. Holub from President Kruger acquainting him with the agreeable news of his exemption from all taxes. This concession, coming too at a time when the funds of the expedition had sunk to a low ebb, was all the more acceptable because a war of tariffs was then raging between Cape Colony and the Republic, and heavy dues were levied on all goods entering from the south, whether in transit or not. Soon afterwards Sir Charles Warren's successful expedition to Bechuanaland led to negotiations, and a better feeling sprang up between the English colonists and their Dutch neighbours.

The first few chapters of this book, treating of the earlier portion of the journey, with the stay at Cape Town and in its district, apart from their scientific value, will be found interesting for the light thrown by them on the politics of South Africa. The reader too will find the remarks on the geology of the Vaal river, the diamond fields of Christiana or Bloembhof, and the future of the Transvaal, very suggestive. Our author observes that however rich in mineral resources, that state, cut off as it is from the sea-coast by a strip of Portuguese territory, is placed at a great disadvantage, and a railroad uniting Pretoria with a harbour of its own is indispensable to enable the Republic to maintain its independence.

With the ascent of the Harts-river-Molapo plains the expedition reached the highest tableland of South Africa, and at the same time passed from the system of the Orange river to that of the Limpopo. This last-named stream is typical of African rivers in general, with its channel now filled with a raging torrent, now almost desiccated, admitting of but little cultivation along its banks, and forming cataracts, like the Nile, the Congo, and the Zambezi, in its lower course. The time is doubtless not far distant when the genius of the white race will devise a way of turning these obstacles, and ensure rapid and easy access to the healthy and productive regions of the interior.

Entering Bechuanaland, or that part of it known as Bamangwato-land, our author found the natives anxious to be taken under the British protectorate, an anxiety partly due to their dislike and fear of the Boers as well as to their desire of being defended against the hostile Matabele. He warmly advocates a more active policy on the part of the English Government, for Africa, he observes, is waking to a new life; Germans, Dutch, and Portuguese are bestirring themselves, and light is beginning to dawn upon the dark continent. The time, therefore, for irresolution and indifference is past, England must grapple firmly, vigorously, and without delay, with the African problem.

Khama, king of the Bamangwato, whose portrait is given in this book, is an intelligent negro of Bantu race. Having learnt the advantages of civilisation he does his utmost to civilise his people, suppresses heathen rites and fetishism, prohibits the sale of intoxicants and protects missionaries. His capital Shoshong is a model of what a native town may become, even under a negro ruler. Khama, indeed, stands alone among native potentates of South Africa as a reformer and benefactor of his race; if he had his deserts a monument should be erected in his honour.

Leaving Shoshong on the 30th July, 1884, the expedition continued its journey in a due northerly direction through eastern Bamangwato, a great thirst land, to the salt lakes or pans of Ma-karri-karri. Crossing their snow-white wastes was the easiest work they had experienced, as the clumsy waggons rolled noiselessly and smoothly over the salt. They now entered the land of the Matabele or Amatabele, whose king Lobengula lately sent ambassadors to England. These people, born and bred on the healthy uplands of South Africa, are the terror of their neighbours, owing to their warlike propensities. When, however, they extend their raids to the swampy lands where the Bamangwato are wont to hide from them, they fall victims to malaria, sunstroke, thirst, and hunger; hundreds of them die, and but few who take the war path at their chief's bidding,

ever return to their homes. It was in their country, at the Klamaklenjana springs, that a disaster befell the expedition owing to the poisonous herb, the *machau*, one of the narcotic plants, which the oxen had eaten. Symptoms of poisoning soon manifested themselves, and several fell victims in spite of every effort to save them. Tannin was the only remedy, but of this drug unfortunately very little remained, and there was nothing for it but to make all haste to escape from so dangerous a locality. On arriving at Panda ma Tenka, Dr. Holub found this station, which he had known in the days of its prosperity, much reduced in importance. The elephants had disappeared from the neighbourhood, the ivory trade had declined, and complete anarchy reigned in the Marutse country. It was only through the assistance of Mr. Westbeech, the Englishman who had formerly befriended him, Mr. Blockley and Father Boom, a Jesuit missionary, that our author was able to make the necessary arrangements for his excursions to the Victoria Falls and the Leshumo Valley. These excursions, and the malarial fevers which cost the lives of two of his companions, are described fully in the concluding chapters of Vol. I.

In the opening pages of Vol. II, we find Dr. Holub bearing testimony to the horrors of the slave traffic, which the concerted action of England and Germany has not availed to extinguish even on the sea-coast, while the interior is to this day a prey to this scourge. Travelling by night to avoid the tsetse fly, the expedition once again approached the Zambezi, and having crossed its wide stream with the assistance of the iron boat, set foot on the opposite shore. Here ox waggons and pontoons had to be left behind, and preparations made for the advance into the unknown region lying to the north. The first and most important question the traveller in tropical Africa has to face is that of portering. Stanley, Cameron, and other travellers have been able to hire Zanzibaris to carry their loads. On the Zambezi, however, there were none of these invaluable auxiliaries, porters had to be obtained if possible from the native tribes, such as Matoka and Mashuku, who proved to be very unreliable. They would engage themselves for the whole journey, but on the third day they declined going any farther, and if detained against their will they revolted. The Mashuku went home at the end of every march. Under these circumstances it became impossible to take a straight line, but the expedition had to zigzag from one inhabited place to another. In this way they marched from Gazungula to Mo-Rukumi, from Mo-Rukumi to Mo-Sinkobo, from Mo-Sinkobo to Mo-Monquembo, from Mo-Monquembo to Mo-Ponde, and then to the borders of the Mashukulumbé territory, through districts ruled over by a number of petty chiefs of the Matoka, Mashupia, Marutse, Mabunda, Makalaka, Mankoja, and Mashuku tribes. The farther they went, the greater became their difficulties, the more unreasonable the demands of the porters, the more unfriendly the chiefs. All their disasters culminated, however, in the great misfortune of the 2nd August, 1886, when their camp was attacked and plundered, one of the party, Oswald, killed, and the rest obliged to flee for their lives, across swamps and rivers, till at length, more dead than alive, they reached the Zambezi river, and threw themselves on the generosity of their European friends. Fortunately Dr. Holub was able to save his note-books, but everything else was lost in the sack of the camp and the hurried flight, and several months of rest were necessary to enable them to recover from their sufferings and fatigues and return to Cape Town. In spite of the ill success of the Austrian expedition, the record of what it did and the numerous observations on the ethnology, botany, and zoology of the countries traversed, contained in these volumes, will be found interesting and valuable to those who are on the point of making Africa the field of their future labours.—[E. D. M.]

Theal, G. McCall.—History of South Africa. London, Sonnenschein & Co., 1891: 8vo., pp. xii. and 488. Price 15s. [Presented by the Publishers.]

Previous volumes of this work have been noticed in the 'Proceedings' as they appeared. The present volume embraces a history of events in South Africa between the years 1795 and 1834, including a History of the Southern Bantu Tribes during the early years of the present century. There are seven maps.

Trivier, E.—*Mon Voyage au Continent Noir. La "Gironde" en Afrique.* Paris, Firmin-Didot & Co., 1891: 12mo., pp. ix. and 386, maps and portraits. 3s. 6d.

This is an account of a journey across Africa by, what may now be termed, a comparatively easy route. On leaving the coast at Loango, M. Trivier struck east for Brazzaville, and ascended the Congo as far as Nyangwe, he then shaped his course for Lakes Tanganyika and Nyassa, both of which he descended, and duly arrived at the coast at Quillimane. The volume contains incidental notes on the geography of the region traversed.

Pruen, S. Tristram, [M.D.]—*The Arab and the African: Experiences in Eastern Equatorial Africa during a Residence of Three Years.* With illustrations. London, Seeley & Co., 1891: cr. 8vo., pp. vii. and 338. Price 6s. [Presented by the Author.]

This volume mainly deals with the slave trade, and the daily life of the African. The author lived for three years among the people as one of themselves, and thus had exceptional opportunities afforded him of becoming acquainted with their habits and character; his observations on this subject should therefore be of importance. Other portions of the book treat of the geography of the country, the vegetation and animals, the climate and diseases, the traveller, the Arab, and the missionary. The volume, on the whole, will be of practical service to intending travellers in Central Africa.

Waller, [Rev.] Horace.—*"Ivory, Apes, and Peacocks"; an African Contemplation.* London, E. Stanford, 1891: 12mo., pp. 90. [Presented by the Author.]

In this little volume Mr. Waller considers African matters more from the natives' point of view than is usual. He endeavours to show that Africa will be for the Africans for some time to come, and that preconceived ideas respecting colonisation, however suited to other countries, will be altogether beside the question in Africa.

AMERICA.

Bovallius, Carl.—*Antiquités Céramiques trouvées dans le Nicaragua en 1882-1883.* Pp. 23, 8vo., illustrations.

— *Nicaraguan Antiquities.* Stockholm, P. A. Norstedt & Sons, 1886: 4to., pp. 40, maps and plates.

— *Resa i Central-Amerika 1881-1883.* 2 vols. Upsala, R. Almqvist & J. Wiksell, 1887: 8vo., pp. 483, maps and illustrations. [The above three works were presented by the Author.]

Horsford, E. N.—*The Defences of Norumbega and a Review of the Reconnaissances of Colonel T. W. Higginson, Professor Henry W. Haynes, Dr. Justin Winsor, Dr. Francis Parkman, and Rev. Dr. Edmund F. Slafter. A Letter to Judge Daly, President of the American Geographical Society.* Boston and New York, Houghton, Mifflin & Co., 1891: 4to., pp. iv. and 84, maps and plates. [Presented by the Author.]

An examination of the criticisms that have been made upon Mr. Horsford with reference to his theory of the connection of the Norsemen with the coast of America. Mr. Horsford's previous letter on "The Problem of the Northmen" was noticed in the 'Proceedings' for 1889, at p. 633.

Hubbard, Gardiner G.—*South America.*—*The National Geographic Magazine*, vol. iii. pp. 1-30. March 28, 1891. 8vo., map.

GENERAL.

Raper, Lieut. H., R.N.—*The Practice of Navigation and Nautical Astronomy.* By Henry Raper, Lieut. R.N., F.R.A.S., F.R.G.S. Nineteenth edition, revised and enlarged by Commander Thomas A. Hull, R.N., late Superintendent of Admiralty

Charts. London, J. D. Potter: 8vo., pp. xxv. and 934. [Presented by the Publisher.]

Though more than half a century has elapsed since the first edition of this excellent book was published, it has throughout that period maintained its place in the foremost ranks of works on navigation and astronomy for the use of seamen and travellers. None have surpassed it, and few of the many books published since 1840 have approached it in point of practical utility. While much of the original edition is as valuable to seamen now as it was when the book first appeared, there are certain parts of it in which the changes that the lapse of time has brought about, have rendered revision and extension necessary. Among these is the universal adoption of steam navigation at higher rates of speed than were dreamt of by Lieut. Raper, the no less universal change in the materials in ship-building which has affected the compasses used in ships, especially in ironclad vessels, and the more exact knowledge we now possess, by means of the electric telegraph, of the longitudes of many important places on the earth's surface; in addition to which dock accommodation all over the world has been largely increased, and the information given in the early editions of the book is now altogether short of the present requirements of navigation.

This work of revision and enlargement has been undertaken, and very ably carried out, by Commander Thomas A. Hull, R.N., late Superintendent of Admiralty Charts, who, while making corrections and additions that have considerably added to the value of the book, has wisely left Raper's general arrangement, both in the body of the work and the tables, untouched. Among the principal changes that appear in this edition is an excellent chapter on the variation and deviation of the compass by Captain W. Mayes, R.N., late Superintendent of Compasses at the Admiralty; an enlargement of the table of Maritime Positions, with a table of longitudes accepted for Secondary Meridians; a table of natural sines and tangents, which will be found useful in magnetic computation, and other minor changes which have become necessary.—[J. C.]

Verner, Captain W.—Notes on Military Topography. By Willoughby Verner, Captain, Rifle Brigade, D.A.A.G. for Instruction, South-Eastern Division. London, W. H. Allen & Co.: 8vo., pp. xii. and 127. [Presented by the Author.]

In this book the author has brought together articles which he has, from time to time, published in the 'Illustrated Naval and Military Magazine.' As its title indicates, it is primarily intended for the use of military officers, but also contains many hints that would be of service to travellers, and concludes with a chapter on range-finding.—[J. C.]

NEW MAPS.

(By J. COLES, *Map Curator*, R.G.S.)

ASTRONOMICAL.

Sternhimmel.—Der —, zu jeder Stunde des Jahres. Drehbare Sternkarte. Ausgabe für Mitteleuropa. Frankfurt a/M. Deutsche Lehrmittelanstalt, F. H. Klodt. Price 1s. 6d. (*Dulau*.)

EUROPE.

Bayern.—Topographischer Atlas von —. Scale 1: 50,000 or 1·4 inches to a geographical mile. Sheet 65, Passau, Ost und West,—75, Mindelheim, Ost. Price 1s. 6d. each sheet. (*Dulau*.)

Deutschen-Reiches.—Karte des —, Abtheilung Königreich Bayern. Scale 1: 100,000 or 1·3 geographical miles to an inch. München. Sheets: 577, Gunzenhausen; 578, Weissenburg; 579, Beilngries; 593, Nördlingen. Price 1s. 6d. each sheet. (*Dulau*.)

No. VI.—JUNE 1891.]

Julischen Alpen.—Skizzen zu: Entwicklung der Wasserscheiden im Gebiete der —. Petermann's 'Geographische Mittheilungen,' Jahrgang 1891, Tafel 7. Justus Perthes, Gotha. (*Dulau.*)

Monte Somma and Vesuvius.—Geological Map of —, constructed by H. J. Johnson-Lavis, M.D., M.R.C.S., B.ès.s., F.G.S., &c., during the years 1880–88. Scale 1: 10,000 or 7·29 inches to a geographical mile. George Philip & Son, London, E.C. Price 2l. 2s.

This map is the result of a careful survey made by Dr. H. J. Johnston-Lavis, between 1880–88, two years of which were spent in investigating the general stratigraphical arrangement of the different deposits, with the special character of each; and in order to facilitate this survey, he took up his abode at different spots round the base of the mountain. It has been reproduced from the original map made by Dr. Johnston-Lavis on the spot, and exhibited by him at the Geological Congress, 1888. A full description of the system of colouring employed is given, and the map is accompanied by a pamphlet containing a brief account of the eruptive phenomena and geology of Monte Somma and Vesuvius.

Scotland.—The Tourist's Map of —. By J. Bartholomew, F.R.G.S. Showing the new county boundaries so far as settled by the Boundary Commissioners. Scale 1: 645,000 or 8·8 geographical miles to an inch. John Bartholomew & Co., Edinburgh. Price 1s., on cloth 2s.

A noticeable feature in this map is the very clear manner in which all means of communication by rail, road, or steamboat are laid down. The absence of hill shading may be considered an advantage in a map of this class, as the positions of all the greater elevations are indicated, and the heights above sea-level are given in feet. As a whole it is admirably suited to meet the wants of the tourist for general reference, and in cases where more detail is required the reduced Ordnance Survey sheets of Scotland, published by the same firm, will furnish all that is necessary.

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(Stanford, Agent.)

AFRICA.

Africa.—Political Map of —. By J. G. Bartholomew, F.R.G.S. Scale 1: 12,000,000 or 164·4 geographical miles to an inch. J. Bartholomew & Co., Edinburgh, 1891.

At the present time, when so much attention is being directed to the development of African trade, a map such as that under consideration will be

found very useful for reference. The boundaries of the spheres of influence of the European Powers in Africa were accurately laid down at the date of publication, but a change, of quite recent date, has been made with regard to the Portuguese possessions, which it is proposed should extend for a certain distance north of the Zambesi, from Zumbo towards the north-east along the course of the Loangwa river, and thence in a north-easterly direction to the Ruu river; it will therefore be necessary in future editions of this map to make this correction as soon as the exact boundary is more definitely settled. In one corner the British Isles are given, drawn on the same scale as the map of Africa, thus enabling any person to compare the different areas with any part of Great Britain with which he may be acquainted. In addition to the principal map, plans of Zanzibar Island, Mombasa, Capetown and its environs, Egypt from the mouths of the Nile to Cairo, Sierra Leone, St. Helena, Ascension, and Gibraltar, are given on insets. The map is drawn in a very clear style, and, for its scale, is equal to any that have been published in this country.

Africa.—Welch's Key Map of Vineland, New Jersey, U.S.A. (*Dulau.*)

Africa, Central.—The African News Map of —. Published by the African News, Vineland, N.J. With Powell's Radical Key Map of Central Africa. Showing distances and directions from Leopoldville. Scale 1:6,339,320 or 86·8 geographical miles to an inch. (*Dulau.*)

AMERICA.

Brasilien.—Ethnographische Karte von —. Von Dr. Paul Ehrenreich. Scale 1:20,000,000 or 266·6 geographical miles to an inch. 'Petermann's Geographische Mittheilungen,' Jahrgang 1891, Tafel 6. Justus Perthes, Gotha. (*Dulau.*)

CHARTS.

Admiralty.—Charts and Plans published by the Hydrographic Department, Admiralty, in March and April 1891.

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1505 St. Tudwall roads, Pwllheli road.	{ New Plan, St. Tudwall's and Pwllheli roads	1505
1875 Elbe, Weser, and Jade rivers ..	{ New chart, Elbe, Weser, and Jade rivers	1875

No.	Cancelled by	No.
386 Plan of Santo Antonio bay on this sheet	New plan, San Antonio bay ..	1595
238 Kilifi river and approaches ..	New plan, Kilifi river and approaches	238
1310 South-west coast of Pemba island, Mehengangazi	New plan, South-west coast of Pemba island, Mehengangazi ..	1310
873 Amami Ōshima group	New chart, Amami Ōshima group ..	873
983 Marshall islands	New chart, Marshall islands ..	983

CHARTS THAT HAVE RECEIVED IMPORTANT CORRECTIONS.

No. 1491. England, east coast:—Harwich harbour. 2307. Norway, west coast:—Smölen island to Sve fiord. 2308. Norway, west coast:—Brand fiord to Lekö. 2842, *b*. Baltic sea:—Eastern sheet. 2302. Gulf of Bothnia:—Tome point to Tauvö. 2256. Baltic Sea:—River Dvina, from the roadstead to town of Riga. 2643. France, north-west coast:—Raz de Sein to Goulven. 2530. North America, west coast:—San Diego bay to Cape Mendocino. 2795. North America, west coast:—Cerro island. 2448. North America, west coast:—Approaches to Fitzhugh and Smith sounds. 1923, *b*. North America, west coast:—Cape Caution to Port Simpson, southern portion. 2453. North America, west coast:—Brown and Edye passages. 1810. Africa, east coast:—River Zambezi to Mozambique harbour. 2741. South Indian Ocean:—Mayotta island. 1342. Cochin China:—Fan-rang bay to Tong-king gulf. 401. Australia, south coast:—Port Augusta.

(*J. D. Potter, Agent.*)

ATLASES.

Hungary.—Magyarország Megyéknek Kézi Atlasza. Tervezte: Gönczy Pal. Rajzolta Kogutowicz Manó. Posner Károly Lajos és Fia. Budapest. Price 2l. (*Dulau.*)

This is a county atlas of Hungary, containing sixty-eight orographically coloured maps, the heights being given in mètres. The hill shading is effective, the boundaries of minor divisions are printed in red, and the rivers in blue.

Universal Atlas.—The ———. Published by Cassell & Co., Limited, London, for the Atlas Publishing Company, Limited. Part 2. Price 1s. each part.

The present issue of this Atlas contains five maps, viz. Switzerland, Belgium and Luxemburg, Holland, Canada (eastern), and Canada (western). In the map of Switzerland the hill work is effectively drawn, the heights are given in English feet, and a list of frequently used abbreviations in town and mountain names is given. The map of Belgium and Luxemburg is very clearly drawn, all means of communication are laid down, and the importance of towns as regards population is indicated by symbols; an inset map of the environs of Charleroi is given. The same remarks with regard to the drawing and the symbols employed apply to Holland. The maps of Canada have been expressly prepared for this edition of the Atlas; that of Eastern Canada includes Newfoundland, on which the limits of the French Fisheries on the Newfoundland coast are shown.

PHOTOGRAPHS.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. When purchased photographs are presented, it will be useful for reference if the name of the photographer and his address are given.



Turner & Shore, 43 Brewer Street, London, W.

forgotten by those who came here on those occasions and survived them.

I have also to congratulate the Fellows upon the financial condition of the Society. Our total income for the year ending 31st December, 1890, was over 9500*l.*, thanks largely to the great accession of new members in connection with the Albert Hall gathering, while our expenditure did not rise much above 8200*l.* The number of our Fellows has not increased so rapidly since then, that is, in the year ending the 30th April last, but 237 have joined our ranks as against 293 in the corresponding period of 1889-90, and 181 the year before. A certain number have, alas! died, and some have left the Society, but the net increase for the year is 84. Our roll of Fellows numbered 3579 on May 1st.

As you will have learnt from the Report of the Auditors, the total assets of the Society have considerably increased, and we are in a position to give most efficient assistance to any thoroughly well considered schemes which are laid before us. I am very sure, however, that the Fellows will consider that, although we are rich, it is none the less our duty to scrutinise carefully all proposals which are made to us, and to see that the money which they give so generously is applied only to really promising objects. Such we considered to be Mr. Ramsay's explorations in Asia Minor, and Mr. Theodore Bent's examination of the remarkable ruins at Zimbabwe in South Africa.

Instruments to the value of over 600*l.* have been lent during the past year to intending travellers, and thirty-six gentlemen have received instruction from Mr. Coles, partly at the expense of the Society, for the purpose of making them more efficient as explorers.

Our duties dividing themselves into two great classes, the acquisition of knowledge and the diffusion of knowledge, I think the Society will hail with pleasure a considerable increase of our expenditure under the head of "Scientific Purposes," which amounted for last year to nearly 600*l.* That sum included 178*l.* for the purpose just alluded to, 120*l.* for the promotion of geographical education in connection with the Training Colleges, the University Local Examinations, and the Oxford University Extension Movement, and a contribution of 150*l.* towards the salaries of each of the Geographical Lecturers at the Universities of Oxford and Cambridge. I am happy to be able to report that our efforts to promote geographical education in the first of these great national institutions are being crowned with success, thanks to the enlightened views now prevailing there, to the powerful assistance of the Warden of Merton and other friends in high place, and to the zeal and high intelligence of Mr. Mackinder, who is rapidly winning not only golden opinions for himself but an excellent place for his science on the banks of the Isis. Negotiations are now in progress which will, I hope, result in the establishment of a Travelling Scholarship at the joint expense of our Society and of the University of Oxford.

Our Fellows will no doubt have observed that efforts are being made to have the Ordnance Survey pushed on more rapidly than hitherto, as well as to make more generally accessible to the public the results of so much well-directed labour. They will approve, I feel sure, of the Society's assisting these efforts in all legitimate and reasonable ways.

During the whole year we have enjoyed the use of this theatre, and have, as so often before, to thank the University of London for its courtesy and kindness in this important matter.

I may now proceed to review, according to custom, the leading geographical events which have occurred since our last anniversary, and I will begin with Asia, the central and other little-known parts of which have been the field of some of the most interesting explorations of the year. The great journeys through the remote interior of the continent made by Carey in 1885, and by Lieutenant Younghusband and Colonel Mark Bell in 1887, with the previous or contemporaneous expeditions of Prejevalsky and other Russian travellers, have made us now tolerably familiar with the nature of the vast central tracts so far as the old caravan routes are concerned, but wide stretches of intervening country, including lofty mountain ranges, remain still virgin ground. We hear of an important journey performed since his return to India by Lieutenant Younghusband, but we are at present without detailed information regarding it. It is not so, however, with the explorations of the Russians, copious accounts of whose recent work, in so far as it interests men of science, have been published during the year.

First in importance is the great expedition under Colonel Pevtsof, to the command of which this officer succeeded on the death of the original leader, Colonel Prejevalsky. The object of this expedition was to endeavour to reach Lhasa by a more direct route than that attempted by Prejevalsky on his former journeys, namely, *viâ* Khotan and the north-west. Colonel Pevtsof returned to Russia last January, having failed in attaining his main object, but not without making considerable additions to our knowledge. Five thousand miles of topographical survey have been made, and a good series of astronomical and magnetic observations, while forty camel-loads of geological, botanical, and zoological specimens have been brought home in safety. The most interesting results appear, however, to have been gleaned by their explorations in a remote part of Asia of which our ignorance is the greatest, namely the great mountain knot near Polu, where the Kuen-lun proper seems to terminate, or at any rate branches off towards western China to the north-east in one range, and to the east in another not at present so well defined. The interesting letters of Lieutenant Roborofsky, published in our 'Proceedings,' in which the nature of the country travelled over by the expedition, and its animal and vegetable life, are graphically portrayed, give an account of the journey from Russian

territory across the Tian Shan; the passage of the desert to the foot of the Kuen-lun, and the several attempts made to ascend the plateau from Nia, their winter quarters in the Tarim plains. The plateau was reached, but all the efforts made by the reconnaissance parties to advance along it proved fruitless. A distance of about 100 miles along an utterly uninhabited waste at an altitude of 15,000 to 17,000 feet was accomplished, but at great risk; their horses perished, and the parties escaped with difficulty to their depots on the mountain slopes. The north-easterly continuation of the Kuen range, which for several hundred miles to Cherchend and Lob-nor forms the limit of the plateau and overlooks the low plains of the Tarim desert, reaches in its peaks a height of 20,000 feet. At its northern foot, in the sandy tract studded with sandhills, is a succession of small oases dependent on the few streams fed by the snows of the ranges, and the view northwards is bounded by forests of poplars nourished by the moisture existing at some depth below the surface of the soil. Beyond this forest-belt is the pathless desert.

Captain Grombchefsky, in the course of his long journey of 17 months through Central Asia by way of the Pamir (where he explored the course of the Raskem Daria), the Karakorum, and Shahidulla, visited Pevtsof's expedition in its winter quarters, and made two independent attempts to reach the summit of the Tibetan plateau from the side of Polu and the valley of the Keria, down which Mr. Carey travelled in his adventurous journey of 1885. His experiences, however, were more disastrous even than those of the Pevtsof expedition. On his first attempt (December 1889) he ascended from Polu by a pass 19,000 feet high; on his second (May 1890) he found the uplands covered with ice and snow and utterly impracticable. He describes them as a sterile wilderness, intersected by low hills forming deep hollows filled with lakes and pools.

Most fruitful have been the results of the journey of the brothers Grum Grijimalo along the flanks of the Tian Shan and Altai ranges between Kuldja and Hami (April 1889 to December 1890), and thence to Lob-nor and north-western China. One of the brothers is a surveyor, and the other a naturalist who has made a special study of the laws of geographical distribution. In their journey along the Tian Shan they abandoned the ordinary caravan road and travelled along the northern flanks of the range. Between the sources of the three rivers Khusta, Ulan-ussu, and Khorgos, they discovered a great mountain mass, the Doss-Megen-ora, meaning in the Mongol language "Loftiest of Mountains," the altitude of which they state to be 19,700 feet, and in an excursion south to Turfan they came upon a tract which their boiling-point observations proved to be below the level of the sea.

M. N. Yadrintzeff, an archeological traveller, has carried out an expedition to determine the exact site of the famous city of Karakorum, the capital of the Khans of Mongolia; a question which has been in dispute ever since the visit of Marco Polo. He believes he has identified

the remains at Kara Balgassum, on the left bank of the Orkhon, in $47^{\circ} 15' N.$, and $102^{\circ} 20' 15'' E.$, as those of the city. The ruins here cover an area six miles in circumference, the centre of which appears to have been occupied by the palace of the Khan.

Central Asia, and indeed the whole continent of Asia from north-west to south-east, has been crossed, or at least the journey brought to a termination, during the year, by Prince Henry of Orleans and his companions. To this young prince belongs the honour of having traversed the continent by a route not previously traversed in its entirety by any other traveller. Quitting Russian territory near Kuldja in September 1889, he crossed the desert to Lob-nor in November, and arrived at Ta-t sien-lu on the Tibetan frontier of China in July 1890; thence travelling almost due south through the south-western provinces of China, he descended by the Red River into the French territory of Tong-king, and arrived in France in December last. The collections of zoological specimens made by Prince Henry were brought down from Ta-t sien-lu by the helpful intervention of Mr. Pratt, without whose aid they might have been lost to science.

In the summer of 1889 and 1890, the enthusiastic naturalist just mentioned, who had been for some time previously engaged in natural history explorations on the lower Yang-tsze-kiang, made two journeys to Ta-t sien-lu, an interesting account of which, illustrated by a series of fine photographic views of the scenery, was given by him to the Society during the session. Through the rugged mountainous country of Sze-chuen, Mr. Pratt's route was nearly the same as that of Mr. Colborne Baber and other travellers, but at Ta-t sien-lu he explored a part of the magnificent snowy range extending north and south near that city, and made additions of some value to our knowledge.

Further south, the journey of Mr. A. R. Agassiz overland from Hai-phong in Tong-king, via Langson to Canton, has made us acquainted with the trade routes of a part of Southern China, of which little was previously known.

Geographical exploration in Asia has been largely overshadowed by the wider fields and newer interests of Africa, yet from the side of India a good deal has been done to extend our information, not so much perhaps in the broad geographical fields of High Asia, as in directions more important to imperial interests, where accurate topographical knowledge has been gained for the first time of that ever narrowing area which intervenes between ourselves and Russia. It should not be forgotten that the gradual building up of exact geography in Asia is largely in the hands of imperial officers working in the interests of the State. They are bound by imperial political interests to preserve as more or less confidential the information that they may acquire, and it thus happens not only that a very large measure of recent geography is yet unpublished to the world, but that something of a check has un-

doubtedly been given to individual enterprise in transfrontier regions. We are not without hope that better arrangements with regard to these matters may be ere long arrived at. So much information has been obtained within the last two years (especially on our north-west frontier) that it is doubtful whether since the annexation of the Punjab so large an acquisition of knowledge affecting both our military and political status on that border has been gained in so short a time. Much of it is quite sufficiently unexpected in character to prove once more (if proof were needed) how inadvisable it is to indulge in political forecasts without fairly complete topographical data at command. The mapping of Persia is being gradually reduced to something approaching systematic topography. For many years the basis of our Persian mapping has been the excellent work executed by St. John in that country many years ago. A few only of the travellers who have lately traversed Persia have possessed sufficient scientific training to assist materially in turning geographical fancy into topographical fact. Amongst them should be mentioned General Schindler, director of Persian telegraphs, and Lieut. Vaughan, some account of whose work has been recently laid before the Society. Quite lately, however, the Indian transfrontier system of survey has been applied (with some modifications) to Persian territory, with the most satisfactory results. Not only have we obtained a very fairly accurate knowledge of a large area of most important country, but we have now the means of gathering up the geographical threads and patches of previous fancy-work, and piecing them together into a comparatively homogeneous whole. It would be a mistake to regard Persia any longer as a country open to exploration of the trans-Himalayan or Central African type. Ordinary travellers with a taste for reconnaissance can add little to our present information in the purely geographical sense. What we now require, chiefly, are a few well-placed co-ordinate determinations of the position of prominent features on which future topographical detail can be based as on a framework, and this, it is hoped, may be eventually secured by a more liberal use of the Persian telegraph system in fixing differential longitudes.

Southern and Western Baluchistan, from the Mekran coast of the Arabian Sea to Seistan, have added much during the last year to our map knowledge of South-western Asia. All this country now falls under the regulation system of transfrontier surveys conducted by Colonel Holdich of the Indian Survey Department, and consequently its mapping can hardly be said to possess any further the characteristics of geographical exploration, although the greater part of the ground is now trodden by Europeans for the first time in recent history. A well-balanced trigonometrical series has been pushed westwards from the Indus through Mekran, and is now stretching its arms towards Persia so as to give solid support to our recent surveys in that quarter, and every

route from the sea-coast to the Helmund has been thoroughly overhauled. That excellent friend to geography, Sir Robert Sandeman, has taken care here, as elsewhere, that nothing shall be wanting in political support to the efficient map illustration of that interesting part of the world, and ere long the Perso-Biluch frontier and the deserts south of the Helmund will be as well known as the Punjab or Sind.

But by far the most important of all our recently acquired knowledge is that which pertains to the border regions immediately west of the Suliman Mountains. It will be within the memory of those who interest themselves in Indian expeditions, that the winter before last Sir Robert Sandeman traversed the semi-independent countries which intervene between the Afghan and Indian borders, from Quetta northward to the Gomul river, which was then for the first time opened out as an available route from India to the highlands. Last winter this excursion was followed up by a still more extensive reconnaissance westwards, supported by troops from Quetta, who were subsequently employed in reducing a refractory section of the Sherani tribe. The result of these two Zhob Valley expeditions is that an area of many thousands of square miles has been brought within the pale of accurate mapping by Colonel Holdich and Captain Mackenzie, R.E., and many unknown quantities have been eliminated from the problems which vex our frontier politicians. The expedition of 1883, when the Kaisargarh, the highest peak in India south of the Himalayas, was ascended for the first time, revealed a wild mass of tumbled and jagged mountain peaks, stretching away westwards into the heart of what was then known as Afghanistan, which it was impossible at that time to penetrate. Much of this has now been reduced to well-ordered topography, many tamarisk-fringed valleys (including that of the hitherto unmapped Kunder leading to Kandahar) have been traversed; over the gentle olive-clad slopes of the lower hills our surveyors have climbed to wild limestone ridges, where the spreading chilghosa pine hangs over the cliffs and defiles, from which again a vista of other (but more gentle and more scattered) mountains intersecting wide salt-white plains has been obtained still further westwards. Several most important frontier passes south of the Gomul, about which much has been said and very little known, have been thoroughly examined; and we now possess something more than an indefinite idea as to the extent of the Amir's authority on his eastern border in a strictly geographical sense. If we have lit upon one or two topographical surprises which may lead to a modification of our military views, we have at least made our discoveries in good time, and once more proved the advantage of a sound geographical basis for all considerations of imperial defence. Incidentally it may be mentioned that in the heart of the Sherani country, previous reports as to the existence of oil were confirmed, and springs were found where the oil bubbled to the surface as clear as if it had been artificially purified.

In the north of India the recent Meranzai and Black Mountain expeditions have given Captain Wahab, R.E., an opportunity for securing some excellent military mapping, although neither of these expeditions has done much towards extending our geographical knowledge far beyond the limits of the field of military operations.

From the elevated regions of High Asia we have recently heard much more of the proceedings of our neighbours, Russian, American, and French, than we have of British explorers. Our own little party of trans-Himalayan travellers, and the native explorers whose strange tales of travel in Tibet and Mongolia were not long ago included amongst the most interesting records of the Indian Survey, have been silent lately; but it would perhaps be rash in these days of confidential geography to assume that nothing is being done because nothing is said of what is being done. Last year at least one British officer returned to India with a most honourable record of geographical information achieved by patient, painstaking observation, such as is not often to be found allied to the keen instinct of sport and adventure. This officer, Captain Bower of the Bengal Cavalry, has put quite a new complexion on much that was hazy and indistinct in the hydrography of the little-known country lying west of the Kasbgar plain. His extraordinary success in bringing to justice Dád Mahomed, the murderer of our trade pioneer Dagleish, the quest for whom might have extended over the whole continent of Asia, is already a matter of history, and has added one more proof of the singular certainty of the fate that awaits those who hold the lives of British officials cheap on our border—a certainty which does more to win us respect, and even popularity, amongst a barbarous people than any amount of misplaced leniency. In the prosecution of his search for sport and for Dád Mahomed, Captain Bower took careful note of the countries through which his wanderings led him, and he has brought us so many useful hints, and so much well-considered survey information, that he must in future rank as a geographical observer of a high order. It should be remembered that Central Asia is a rapidly narrowing geographical “quantity,” and that geographical exploration, either in Central Asia or elsewhere, is no longer a British monopoly. In this most elevated wilderness in the world, where our interests in the general advancement of Western civilisation are paramount to those of any other European nation, we are in danger of finding ourselves outpaced by others. It is indeed, so to speak, on our own side the border that the largest blanks now occur in our maps; chiefly, however, for the reason that it is between the Himalaya and the Kuen Luen that the most inaccessible country that the world contains probably lies. It is true that a few scanty suggestions are offered us on the face of our modern Atlas, but the origin of these outlines is lost in the mists of antiquity. It is certain that routes once existed even in these back premises of the world, but north of Pandit

Nain Sing's well-known traverse through the lake regions of Western Tibet we have no certain geographical knowledge. It may happen with some of the shadowy lakes and mountains shown on our existing maps, that they may have to shift their geographical position, as in the deplorable case of the Mountains of the Moon, until some Asiatic Stanley arises to bring them to a safe anchorage. Happily there is hope that such a one will arise soon.

The gradual absorption of Upper Burma into our Indian dependencies and its reduction to a condition of law and order have led to many small expeditions and local boundary definitions which have considerably assisted in clearing away the geographical clouds which enveloped that country. Survey and geography in that part of Asia are in the able hands of Major Hobday of the Indian Survey, and it is not likely that Burma will long offer much opening to the enterprise of individual explorers. Every little Burmese expedition has had its quota of surveyors attached, and all Upper Burma is rapidly becoming a well-illustrated page in the volume of regulation mapping.

There is every hope that in the near future the upper sources of the Irawadi and Salween will be finally and fully explored, and with this most interesting geographical knot unravelled, there will disappear the last vexed question of any large importance in connection with Asiatic hydrography. On the east of Burma, the definition of the Siamese boundary which was laid down by Mr. Elias in the winter of 1890, has also lent opportunities for improving our knowledge of the course of the Salween and its tributaries, and in connection with it, Captain Jackson, R.E., has already made some inroad into that Indo-Chinese borderland which still offers a field for scientific geographical exploration.

In the Caucasus, Mr. G. P. Baker made some interesting though limited explorations in Daghestan. The Eastern Caucasus, though less attractive, by reason of its lower altitude, scanty vegetation, and the absence of large glaciers, than the central and north-western chain, is not deficient in interest, but this corner of it had been previously visited only by one English traveller, Mr. Abercomby, during the previous summer, and was considered an unexplored region a short time before, by our medallist Dr. Radde, who made a short journey into the mountains. Mr. Baker's topographical studies and ascents were chiefly in the Basard-jusi district, an excellent account of which, accompanied by a map, he has given to the Society.

In the central chain Mr. Holder made several glacier expeditions which have thrown much new light on the orography of the Adai Choch group, near the sources of the Rion; and Signor Sella spent three months in travel and photographic delineation of the higher ranges and their inhabitants. His views have been exhibited at one of the Society's conversazioni. The Russian Staff, under the direction of General Shdanoff, has carried on the admirable new physical survey of the chain, of which

the map of the glaciers of Suanetia, just communicated by M. Jukoff to the Society, is a very important and interesting instalment.

At the concluding meeting of our last session we had the pleasure of listening to the description given us by Mr. Theodore Bent of the explorations and discoveries he and Mrs. Bent had made in the spring of 1890 in Cilicia Tracheia. This rugged district, now clothed with almost impenetrable brushwood, thinly peopled by a wild race of shepherds, was, until the tenth century, one of the most flourishing corners of the world. Before it became a Roman province it was a district called Olba, ruled over by a dynasty of priest-kings; at the present time ruins of innumerable towns and villages are met with from the sea coast up to 6000 feet above sea-level. Mr. Bent succeeded, by disinterring and deciphering numerous inscriptions, in identifying the site of the ancient capital, besides verifying the positions of numerous other places in this part of Cilicia. His surveys also enabled him to furnish us with a much improved map of the district, which has since been published, with his paper, in our 'Proceedings.'

Slowly and gradually the English ideal of scholarship seems to be altering. There was a time when that word meant nothing more than an exact acquaintance with the received text of a limited number of classical authors, together with the power of imitating the phraseology and modes of thought therein contained. That was all very well in its way, and rose indeed not unfrequently to the level of a fine art, but even when this was so the results were not very valuable, and hardly made any serious addition to literature. Now, however, a higher ideal is being evolved, scholarship is beginning to mean a real knowledge of the distant past, more especially of those civilisations, the Hellenic and the Roman, to which we mainly owe art, literature, law, and government—the beginnings, indeed, of all we possess that is most valuable, save only those ideas which, as a contemporary Spanish writer has happily said, were evaporated from the ashes of Palestine.

Asia Minor, one of the theatres of human action in which the influence of Greece, of Rome, and of Palestine acted most powerfully—Asia Minor, whose history connects not only with these great civilisations, but with the far less developed yet still important civilisations of Persia and the further East, has always attracted the attention of serious historical students, and many attempts have been made to add to our knowledge of it by English travellers, since first, 160 years ago, the foundation of the Dilettanti Society began a new epoch in our knowledge of antiquity.

Our own Society has this year been able to make a very important contribution to our knowledge of Asia Minor by publishing a volume of nearly 500 pages, the results of the explorations made by Professor Ramsay, a scholar who, claimed partly by the University of Oxford and partly by that of Aberdeen, does much honour to both. The volume of which I speak is now ready for distribution to all our Fellows who apply

for it, and I am sure that on examining it they will think that the Council as their mandatory has done wisely, as well in publishing it as in assisting in other ways Professor Ramsay's explorations.

Turning to Africa, that not soon to be exhausted field of geographical enterprise, the ardour of explorers has not slackened for a moment. Travellers of many nationalities have addressed themselves to exploration of the minor unknown areas, and in many cases, it must be allowed, results of much novelty and interest have been obtained.

Among the expeditions recently set on foot in continuation of the exploration of the remoter central parts of the continent, one of the most ambitious is that of M. Crampel, who started in December last from the French possessions on the Congo, to ascend the great northern tributary the Mobangi, and at the limit of navigation to traverse on foot the space, now a blank on our maps, extending thence to Baghirmi and Lake Chad; intending, if circumstances permit, to continue his adventurous route across the Sahara to Algiers. By latest news we learn that M. Crampel had reached the Upper Mobangi, and before starting with his large land party had ascended one of its tributaries, and made additions of value to the cartography of the region.

A journey which has yielded information of striking interest has been that of Messrs. Jackson and Gedge, to which I have already alluded. These gentlemen were despatched by the Imperial East African Company, from Mombasa on a mission to Uganda via the north-eastern shores of Victoria Nyanza. Part of the route to the lake was through a rugged and well-wooded district, and was new. An excursion to the north across the great crater of Mount Elgon, an extinct volcano, was full of interest. The excellent map prepared for our 'Proceedings' from the notes and surveys of these travellers by Mr. Ravenstein, forms a valuable addition to our knowledge of this important part of Central Africa.

A little further south, in the fertile district of Usambara, Dr. O. Baumann has continued his surveys and exact enquiries into the products and resources of the country. The adjoining country to the north has also been studied by Dr. Meyer and admirably described by him in his book entitled 'Account of the First Ascent of Kilimanjaro,' which he has published since he favoured us by giving a condensed account of his journey at one of our meetings last Session. In this work much detailed information is given regarding the geography, climate and vegetation of the country between the coast and Kilimanjaro, besides the narrative of his journey and ascent of the famous African mountain.

The map of East Africa is, in short, being rapidly filled up. A splendid contribution to this result during the year has been the volume of profiles and sketches forming a continuous illustration of the configuration of the country along the route followed by Count Teleki's expedition from Pangani to Lake Samburu or Rudolf, by the Count's companion, Lieut. Von Höhnelt, in advance of the narrative of the expedition,

which we believe has not yet appeared. Some addition to our knowledge of this region was also made by Dr. Peters during his expedition, undertaken with far other objects than those of geography, from the mouth of the Tana to Uganda, in the upper course of the Tana, the serpentine course of which he traced to the southern slopes of the snow-capped Mount Kenia.

Dr. H. Schlichter, who has made the Ptolemaic Geography of East Africa and the Nile sources his special study, read us an able paper during the present Session on the results of his careful re-examination of Ptolemy's text and the *Periplus*, by the light of the most recent discoveries and surveys, in which he believes he has proved the substantial accuracy of Ptolemy's information.

In Nyassa-land and the recently acquired British territory to the north and west of that region, we owe much to the geographical zeal and enterprise of our Consul, now H.M. Commissioner for those territories, Mr. H. H. Johnston, who opened our present Session by reading a paper on his journey of 1889-90 through the country lying between the north end of Lake Nyassa and Lake Tanganyika, during which he visited Lake Rukwa or Leopold, previously seen by only two travellers, Mr. Joseph Thomson and Dr. Kaiser. The result of this journey has been a considerable alteration in our maps as regards the southern end of the lake, and much new information concerning the country and people; information which has been supplemented by another paper, communicated to the Society by his companion in the journey to Rukwa, Dr. David Kerr Cross, whose long experience in the country and knowledge of the natives renders him a most competent authority. Mr. Johnston has since returned to East Africa, with ampler means and wider jurisdiction, and we may be assured the interests of geography and the allied branches of science will be well cared for during the numerous pioneer journeys into the interior which his political duties will entail. Mr. Joseph Thomson, now in the service of the Chartered South African Company, north of the Zambezi, has carried out a journey from the Shiré to the Garenganze country south-west of Tanganyika, partly over new ground, in which so zealous a geographer cannot have failed of reaping a harvest of new and interesting information, but of which no details have at present reached us. A short but most interesting journey has also been made by Mr. J. Buchanan, our Consul in Nyassa-land, up the valley of the Ruu river, in his report of which is a description of the remarkable falls in the upper course of the river. In the same region Mr. Alfred Sharpe has made another contribution to our knowledge by his journey from the western shore of Lake Nyassa south-westward to a little beyond Zumbo on the Zambezi; as in his previous journey further south, he mapped the country along his line of route.

The recent advance of a pioneer body of miners and settlers to the newly-acquired but little-known British territory in Mashona-land has

brought us, as was anticipated, a large amount of geographical information, and necessitated a thorough alteration in the previously existing map of Central South Africa north of the Limpopo. A general description of the country was given at one of our meetings during the Session by Mr. Maund, which we were able to illustrate by a map embracing all the information gleaned by Mr. Ellerton Fry, the surveyor to the pioneer expedition, and others. Our knowledge of this extensive region is sure rapidly to increase, and we have within the past few days received from our Associate, Sir John Willoughby, a valuable map of Mr. Doyle's route through the whole length of Gaza-land from the plateau in the north-west to the mouth of the Limpopo.

A subject of historical and somewhat romantic interest connected with this region, in which are numerous traces of ancient gold-mines, is the existence in many places on the plateau of massive stone ruins of walls, towers with spiral staircases, and gateways, the first intimation of which, at least in recent times, was given by Carl Mauch in 1871. Curiosity has been further stimulated by the photographs of some of the ruins, taken by members of the pioneer expedition, and the detection of a peculiar style of ornamentation running through nearly the whole. As a thorough examination of these ruins without loss of time appeared advisable, the Council of the Society invited Mr. Theodore Bent, the explorer of Phœnician and kindred remains in the Persian Gulf and the Levant, to undertake the task, an invitation which he promptly accepted. The South African Company telegraphed immediate orders to their officers to put a guard on the ruins to save them from disturbance until Mr. Bent arrives on the spot, and contributed a similar sum to that voted by the Council towards the expenses of the expedition. Mr. Bent left England on his mission at the end of January. The extent of now wild unpeopled country over which these ruins are spread, is far greater than was at first suspected, as we learn from the information given to the Society by an old traveller in the region, Mr. G. Phillips.

In the Congo region, explorations of importance have been without interruption carried out by the officers of the Free State. The blank space between the Aruwimi and the Welle has been traversed by Captain Becker, who set out from Yambuya in a north-north-west direction and reached the Welle at the end of a long march of 200 days, partly through dense virgin forests. Captain Delaporte has fixed by astronomical observations the positions of numerous points on the Lower Congo. Mr. Hodister has ascended the great southern tributary of the Congo, the Lomami, and crossed and re-crossed by land the intervening country between that river and Nyangwé, on the Congo, surveying his route. The Lomami he describes as a great, though mostly shallow, stream, 1000 to 1300 feet in width, with a remarkably dense population on its banks. A French explorer, M. Cholet, has added to our knowledge of the vast river system of the Congo by his ascent of the Sangha, an

important tributary, varying in width from 1000 yards to $1\frac{1}{2}$ mile, which enters the Congo at Bonga. Lastly, Captain Van Gèle has re-ascended the Mobangi and fixed, by astronomical observation, the position of the great northern bend of the river, which proves to be half a degree further north than was laid down in our maps. He reached a point near Dr. Junker's furthest (on the east), so that it is now certain, as another Belgian officer, M. Roget, has travelled the intermediate distance by canoe, that the Mobangi and the Welle are one and the same great stream. Thus the southern country of the Soudan within reach of the Upper Nile is now found to be connected by a river, in great part navigable, with the Congo.

In the region of the Niger, additions of importance have been made to our knowledge by an exploration conducted by Colonel Claude Macdonald, now Her Majesty's Commissioner to West Africa, up the Benué branch and its northern tributary the Kibbé, which was ascended nearly to its sources. A survey of this river, besides other minor tributaries, was made by Colonel Macdonald's companion, Captain Ferryman, and the result has been the satisfactory definition of the Niger basin from that of Lake Chad. An account of the populous country of Yoruba and the British Protectorate of Lagos to the west of the Niger has also been contributed during the year by the late Governor, Sir Alfred Moloney, now Governor of British Honduras. A large portion of the same country, so interesting to physical geographers from the long stretch of inland navigable waterways parallel to the coast, has been investigated with scientific aims by Mr. Alvan Millson, who has made a route survey of the portion of the interior he travelled over. The country inland, now forming the "hinterland" of the German colony of Cameroons, has also been explored up to the Benué by Lieutenant Morgen; and Dr. L. Wolf, favourably known for his previous work on the Congo, has penetrated far inland from the German coast settlement of Togo, and besides other valuable information gleaned, has verified the account given by Dr. Duncan (a member of Allen's Niger Expedition of 1841), of a journey made by him from Whydah by way of Abomey to a remote town named Abofodia. This account, and the existence of the town and rivers described by Dr. Duncan, were disputed by Dr. Barth. Science has sustained a heavy loss by the death of Dr. Wolf on this expedition.

The exploration of the many wide tracts of little-known country in the interior of the island of Madagascar has made some progress during the year. Thus Mr. G. F. Scott Elliot's journey from the capital to Fort Dauphin at the south-eastern extremity of the island, has yielded us much new information, especially regarding the distribution of the forests and the physical geography of the island to the south of Fianarantsoa. A French expedition also, under MM. Catat and Maistre, has done much valuable work. The island was crossed from east to west near the 16th parallel, and a long journey made to the south,

where, amongst other geographical gains, the sources of three considerable rivers were discovered and the main watershed of this part of the island accurately defined.

In New Guinea, the chief exploring work, as far as the British part of the great island is considered, has been done, as last year, by the indefatigable administrator, Sir William Macgregor. Besides many minor journeys resulting in the definition of the local topography of various districts, he has this year explored, with a view to founding a Government station, the wide tract of fertile country lying between Maiva on the coast opposite Yule Island, and the foot of Mount Yule, one of the culminating peaks of the mountain range, upwards of 10,000 feet above the sea-level. Sir William also accompanied through this country an expedition sent out by the Geographical Society of Melbourne, under Mr. Belford (a companion of Sir William's two years ago in his ascent of Mount Owen Stanley) for the purpose of attempting the ascent of Mount Yule. According to recent accounts Mr. Belford's party reached the summit of Mount Yule, which proved to be one of a small number of peaks isolated from the Owen Stanley Range; much information was, besides, gleaned regarding the nature of the country, in this part of the island.

With regard to Australia, the leading event of the year is the departure from Adelaide of a well-organised expedition, equipped at the cost of that munificent patron of geographical enterprise in Australia, Sir Thomas Elder, for the purpose of completing the exploration of the interior by surveying the large areas which still remain a blank on our maps, and lie chiefly to the west of the overland telegraph line. The expedition, which, under the direction of the Adelaide Geographical Society, aided by the Councils of the sister Society of the other colonies is commanded by an experienced Central Australian traveller, Mr. David Lindsay, and includes specialists for the investigation of the Geology, Zoology, and Botany of the country, left Adelaide in April last.

In the great continent of America, where the work of geographical exploration is always noiselessly progressing, the year presents a few salient features which it is necessary to recall. Thus, Dr. G. M. Dawson of the Canadian Geological Survey, whose Official Report in 1888, on the exploration of the Yukon region and neighbouring part of British Columbia, formed so solid a contribution to our knowledge of North-western America, has this year reviewed the regions of Canada still remaining unexplored. He finds that there are no fewer than sixteen areas of large extent in the Dominion of which we have scarcely any definite knowledge, altogether amounting to 954,000 square miles, a larger expanse of territory than that directly ruled by the British Government between the Himalayas and Cape Comorin. To one of the most meritorious of these north-western explorers and surveyors, Mr. Wm. Ogilvie, the Council have fulfilled an obvious duty in awarding this year one of the prizes of the year.

A further gain to our knowledge of that picturesque and thoroughly alpine range, the Selkirks, has been made this year by a party of which our associate Mr. Harold Topham was a member. Several peaks left for his successors by the Rev. Spotswood Green on his exploration of the previous summer, were ascended and some rivers traced to their sources in the glaciers.

In South America the enterprising geographers of the Argentine Republic, one of whom, Don Ramon Lista, the Council have had the pleasure of electing an Honorary Corresponding Member of the Society, have renewed, or continued, their researches in the interesting region lying along the eastern slopes (in Argentine territory) of the Chilian Andes. In this picturesque region, rich in lakes, bordered with forests of beeches, Dr. Kurtz and Dr. Bodenbender, both of Cordoba, made in 1887 a detailed study of the slopes between the rivers Diamante and Negro, the results of which they have published in the present year. The fate of Captain Page, of the Argentine Navy, who read to the Society in 1889 a paper on the Gran Chaco and its rivers, and who perished last July in the attempt to ascend the river Pilcomayo in an unfavourable season, has been deeply regretted by the many friends of this enthusiastic explorer.

Admiralty Surveys.—I am indebted to the Hydrographer, Captain W. J. L. Wharton, R.N., F.R.S., for the following summary of the year's work in this important part of the Government service:—

Under the orders of the Lords Commissioners of the Admiralty there have been employed in hydrographical surveys in various parts of the world, eight steamships of war and two hired small steam vessels, their crews consisting of 75 officers and 664 men.

The several localities where these surveying vessels have been actively engaged are respectively:—The shores of Great Britain, Nova Scotia, Newfoundland, Labrador (Belle Isle strait), Africa, east coast, Seychelles islands, China, Australia, Tonga islands, and New Hebrides. A full report of the work executed by each vessel has been prepared, and will be presented to Parliament in accordance with annual custom. What has been accomplished may be summarised as follows:—

On the shores of Great Britain, the re-survey of Falmouth harbour was completed. Various localities in the Thames where changes are constantly taking place, were examined. A new plan on a large scale was made of Blyth, where recent harbour improvements have been in progress to meet the requirements of the port. Off the Humber an area of 180 square miles immediately westward of the Outer Dowsing shoal was sounded over, in continuation of work done in this vicinity in former years; this resulted in finding a sandy ridge, heretofore unknown, one mile long and one cable broad, having 27 feet on it at low water. At Harwich a considerable area was re-examined, the soundings showing that in many places the depths have somewhat decreased since the previous survey.

In Cardigan Bay, on the west coast of Wales, the re-survey of the eastern shores from Mochras island southward to Allt Wen was completed. Separate plans of Barmouth, Aberdovey, Aberystwyth, and New Quay were likewise executed.

In the Firth of Solway, the principal channel and sandbanks north of Allonby bay to Powfoot were re-defined, the whole of which had entirely changed since 1876, the date when last surveyed. In the Firth of Clyde, the locality where a new bank (Warden bank) had been reported to exist, was closely examined, and the bank defined.

At the entrance to the English Channel, as the soundings obtained in 1889 gave indications of certain irregularities in the depths, ten weeks were devoted to a further close examination of the several localities, which resulted in determining the various banks sufficiently near for modern navigation.

The work on foreign and colonial shores has been as follows:—In Nova Scotia, the survey of the inner portion of Halifax harbour, between Sandwich point and Bedford basin, was completed. On the southern shores of Newfoundland, the coast from La Poile bay westward to Rose Blanche point—which embraced Garia and La Moine bays, also Neck harbour—was surveyed on three inches to the mile. In Belle Isle strait, detailed plans respectively of Forteau, Blanc Sablon, and Red bays were executed.

On the shores of British East Africa, in continuation of work already accomplished, the coast southward from Melinda to Chale point was examined on a small scale.

In Seychelles islands, the shores of Mahé, with the adjacent islands of Silhouette and Mamelle, were surveyed with precision, and a detailed plan made of the outer anchorage and intricate approaches to Port Victoria.

On the China coast, that portion of the Chusan archipelago extending from Isthmus island, near the north part of Pootoo island, to as far south as Mesan island and the south coast of Luhwang island, was surveyed; and this survey embraced the Sarah Galley, Vernon, and Beak Head channels.

In Australia, on the shores of Queensland, the fairway channel eastward of Cape York, between Adolphus and Albany islands, was closely re-examined to ascertain whether any more dangers existed other than the one (previously unknown) upon which the British steamship *Quetta* struck and was wrecked. In the western approach to Torres strait, a month was devoted to charting the Bramble rock patches lying between Booby island and Proudfoot shoal, whose existence had been found by the divers engaged in the pearl-oyster fisheries.

Off the north part of the colony of Western Australia, satisfactory progress has been made towards defining a navigable route through the extensive and dangerous reefs north and west of Cape Bougainville;

many astronomical positions of islands have been thoroughly well determined for the foundation of the survey, and the Holothuria banks, covering a large area, defined. The natives showed themselves hostile on every occasion when met, and care had to be taken in landing on any island situated within a few miles of the mainland to prevent a surprise. Valuable magnetical observations were obtained during the progress of this survey, and in other places on the shores of Western Australia; of these those observed over a spot two miles eastward of Bezout island, where the depth of water was 9 fathoms, with a bottom of quartz-sand and shells, are worth a notice. Here a focus of local magnetic attraction was discovered, the needles being deflected as much as 55° when exactly over it, and a dipping needle dipping to 83° from 55° , the normal amount. This is the strongest local magnetic attraction known in the world. The area in which the attraction was felt was small, and nothing unusual was found when the delicate magnetical instruments were landed on the island of Bezout, two miles distant.

In the Tonga islands the water between Tongatabu and Nomuka was examined, and several reefs charted. In the New Hebrides, a survey on one inch to the mile was made of the island of Efaté, which included the surrounding islets as far as Mataso or Two Hill island; separate detailed plans on a larger scale being executed of Havannah and Fila harbours, as well as Metensa or Ferare bay. Between Mataso and Api islands additional details for the improvement of the charts were furnished; in these was included a small plan of Sesake bay, Mai island.

In the south-west Pacific Ocean, several deep sea soundings were obtained, and in portions of the Eastern Archipelago the neighbourhoods of some reported shoals and banks were sounded over.

In the Indian Ocean, an unsuccessful search, occupying five days, was made for a bank reported to lie between lat. $6^\circ 25'$ and $6^\circ 33'$ N. and long. $79^\circ 21'$ and $79^\circ 28'$ E., over which depths of 35, 13, and 25 fathoms respectively were said to have been obtained.

In the Red Sea, by the further examination of a shoal cast of 14 fathoms situated 11 miles south-eastward of Zebayir island, a dangerous rocky patch with only 22 feet water on it, was found, and has been called Penguin shoal. Its discovery has probably averted a serious disaster, as a number of ships passing through the Red Sea pass eastward of Zebayir islands.

During the year the Hydrographic Department has published 76 new charts, improved 10 charts by the addition of 15 new plans, and made 4750 corrections to the chart plates.

Naval surveying officers have also been employed, with the sanction of the Admiralty, under the orders of the Indian Government and the Dominion Government of Canada. Their results may be briefly stated.

On the west coast of the Bay of Bengal, a new survey has been completed of the shore from Gopalpur south to Bimlipatam, with separate detailed plans of the anchorages at Baruva and Bimlipatam.

The shore-line from Pulicat lighthouse south to Ennore was surveyed, and the Pulicat shoals carefully sounded over, to define their extent and to ascertain whether the reports that had been made, stating that these shoals were farther off shore than shown on the charts, could be substantiated. The survey proved that the charts were correct.

In the Andamans, the Coco group, consisting of Table, Great, and Little Coco islands, with their surrounding dangers, were charted.

On the coast of Burma, the entrance to the Bassein river was re-examined, and also parts of that river up to the town of Bassein.

In Canada, the survey of that part of the north channel of Lake Huron comprised between Mildram bay on the east and Bruce mines on the west was finished, thus completing, with the work done in this locality in former years, the whole of the waters of the North Channel. On the east shore of Georgian bay, fair progress was made in the examination of the coast from Limestone islands to Mouse Deer point, including the several intricate channels leading to the town of Parry Sound.

OBITUARY OF THE YEAR.

Our losses by death during the year 1890-91, ending April 30th, number seventy-six Fellows, including four Honorary Corresponding Members.* In accordance with the custom now followed for many years, biographical notices of those who had distinguished themselves in geographical pursuits have appeared, as soon after their decease as practicable, in the pages of our monthly 'Proceedings.' In this way have been published details of the careers of the following:—Mr. FRANK LINSLEY JAMES, known for his successful expedition in the interior of Somali-land; Sir WARINGTON SMYTH, the eminent geologist; Mr. E. COLBORNE BABER; General FREMONT, U.S.A.; Captain Sir RICHARD BURTON; Señor ANTONIO RAIMONDI, of Lima; M. PIERRE DE TCHIHATCHEF; J. W. BARNS, C.E., engineer of the irrigation canal works of Bahawalpur; T. P. BIGG-WITHER, author of 'Pioneering in South Brazil'; General Sir J. H. LEFROY, R.A.; and the Rev. R. M. INSKIP, Senior Instructor in the Royal Navy. Among our other deceased members there are, however, many who, though not known as geographers or travellers, were distinguished in other walks of life. The complete list is as follows:—

WILLIAM ALDHAM; E. T. ATKINSON, Accountant-General of Bengal and President of the Board of Trustees of the Calcutta Museum. He published (in

* If my attention had been called to them before I delivered the Annual Address last year, I should certainly have brought before our Fellows the remarkable verses on Sir Henry Yule which appeared, I believe, originally in the 'Academy,' and were reprinted recently in the excellent account of our distinguished colleague written by Mr. Coutts Trotter for the Scottish Geographical Society. They turned upon the stately and touching message in which Sir Henry thanked, within a few hours of his death, the Académie des Inscriptions et Belles Lettres for associating him with itself, and more especially upon the phrase "Moriturus vos saluto." The last four lines might well be inscribed upon his monument:—

" 'Moriturus vos saluto':
Breathes his last the dying scholar,
And the far-off ages answer,
'Immortales te salutant.' "

1874-79) a Gazetteer of the North-West Provinces, and several works on Indian Law and kindred subjects. In the scanty leisure hours of his busy official life he devoted himself to zoological studies, and, with a view to the eventual completion of an Indian Fauna, compiled and published several catalogues of the insect families of the Indian region; R. BLYTH BURN; Major-General W. T. BAKER; Captain J. FRASER BRIGSTOCKE; Mr. J. F. BATEMAN; ARTHUR CECIL STUART BARKLY, Governor of Heligoland at the time of its cession to Germany, the son of Sir Henry Barkly, who has for so many years taken an active part in the affairs of our Society; G. F. BLUMBERG; A. J. BURROWS; A. T. BOWSER; J. COGHLAN; Colonel H. CARTRIGHT; W. H. COLE; the Right Hon. Lord COTTESLOE, who for nine years served on the Council of our Society and was Vice-President for four years. He was formerly, as Sir Thomas F. Fremantle, one of the Secretaries to the Treasury, and afterwards Chairman of the Board of Customs, and his financial experience rendered him a useful member of the Financial Committee of our Council, the meetings of which he rarely omitted to attend for many years. He died at the venerable age of ninety-two, on the 3rd of December last; General D. R. CAMERON; FRANCIS H. DICKINSON; F. H. DUTTON; Right Hon. Lord ELLENBOROUGH; H. G. ERICHSEN; J. D. C. EWING; W. FORD EWINGS; E. G. R. FANE; W. J. FOSTER; Sir EDMUND A. GRATTAN; B. HANDLEY; H. NEVILLE HART; the Marquess DE SOUZA HOLSTEIN; MORGAN HOWARD, q.c.; Captain SAMUEL HYDE; S. INGALL; Colonel H. B. JOHNSTON; MOSS JOSHUA; F. G. LEWIN; A. B. McGRIGOR, LL.D., who for many years was a leader of the academic and intellectual side of society in Glasgow, and took a deep interest in education, especially in the University of Glasgow. He was an authority on the topography of ancient Jerusalem, and a contributor to the last edition of the *Encyclopædia Britannica*; A. MACNAB; Hon. C. S. MEIN, Puisne Judge of the Supreme Court in Queensland; C. E. MUDIE, the well-known librarian; Lieutenant J. G. MURRAY; J. S. NOLDWRIGHT; SAMUEL H. NEEDHAM; Captain JOHN PAGE, of the Argentine Navy, who perished in an adventurous attempt, during an unfavourable season, to ascend the Pilcomayo river. He died on the 2nd of August last, on his way down the river to obtain succour for his starving party; Captain W. AGNEW POPE; MYLES PATTERSON; Lieutenant-General CHARLES PASLEY, R.E., C.B.; Captain DANIEL PENDER, R.N., Assistant Hydrographer to the Admiralty, who died on the 12th March last. He had seen much service, especially in survey work in the Pacific, of the hydrography and geography of which he acquired an unrivalled knowledge; Sir BENJAMIN C. C. PINE, K.C.M.G.; Admiral J. C. PREVOST; JAMES RAE; Hon. W. H. RAVENSCROFT; JAMES A. ROSE; J. A. RUCKER; EUGENE SCHUYLER, United States Consul-General for Egypt, and author of "Notes of a Journey in Russian Turkestan, Khokand, Bukhara, and Kuldja (1876)." He travelled in Turkestan at a time when western visitors obtained access with difficulty to that region, and in 1874 read a paper to the Society entitled "A Month's Journey in Khokand in 1873" ('Proceedings' R.G.S., old series, vol. xviii. p. 408); Colonel LAWRENCE SHADWELL; W. G. SHAEN; Sir EDWARD SHELLEY, Bart.; W. D. SPENCE; A. R. CHETHAM STRODE; ALFRED ST. JOHNSTON; WILLIAM WALKER; A. B. WALL; Colonel A. H. WYVILL; G. P. WEBB; Rev. Father A. WELD, the Jesuit missionary well-known in South Africa, where he founded a large number of mission stations. He was employed by the Pope as his delegate to settle ecclesiastical difficulties in Spain and India, and was a man of large acquirements. It was largely through his means that the celebrated astronomical observatory was started at Stonyhurst; MONTAGUE WILLIAMS; HENRY WOOD; RICHARD WORTHINGTON; the ARCHBISHOP of YORK, D.D., F.R.S., who had been Fellow of our Society since 1861, and a not unfrequent attendant at our meetings, in the proceedings of which he sometimes took an active part.

The Indian Surveys, 1889-90.

THE field operations of the Indian Survey were carried on during the year 1889-90 by twenty-four parties and four small detachments. Of these, four parties were engaged on topographical, four on forest, seven parties and one detachment on cadastral and three parties on traverse surveys, four on scientific operations, and two parties and three detachments on geographical surveys. The trigonometrical work was confined, as in the previous year, to one party engaged on the meridian of $96^{\circ} 30'$, and in extending the triangulation of the coasts of the Indian Empire so as to furnish points, consisting of artificial beacons as well as natural land-marks at convenient intervals, as a basis for the Marine Survey Department. The electro-telegraphic longitude operations, which had again been temporarily suspended owing to paucity of officers, were resumed. Seven arcs of longitude were measured between trigonometrical stations in the Punjab, Baluchistan, and Central India, and the longitude of Kalianpur in the territories of the Nawab of Tonk, Central India, the adopted origin of the geodetic elements of the Survey, was determined. It was found that the value of the longitude of that station, as accepted by Colonel Everest and his successors, was $2^{\circ} 23' 29''$ too large.

The tidal operations were continued as usual, observations with self-registering gauges being taken at seventeen stations in India, Burma, Ceylon, and the Andaman Islands. Three observatories, viz. Colombo, Galle, and Madras have been dismantled, and three new observatories at Trincomalee, Minicoy, and Diamond Island, at the mouth of the Bassein river in Burma, have been selected, while it has also been decided to establish observations at Jashk and Bushire in the Persian Gulf.

Great additions were made to the existing geographical knowledge of the countries on the north-east and north-west borders of India, no less than 97,792 square miles, mostly of unknown country, having been brought under survey. The topographical party employed in Baluchistan executed a large amount of geographical work, in addition to the regular survey of that country. Colonel Holdich and Lieut. Mackenzie accompanied the expedition under Sir Robert Sandeman to the Zhob Valley in December 1889, and surveyed an area of 4500 square miles of new country on the $\frac{1}{4}$ -inch scale. Similar surveys were effected in Western Mekran and on the Perso-Baluch frontier by detachments under European assistants. The results comprised an area of 30,760 square miles. Assistant-Surveyor Yusuf Sharif, K.B., returned to India in October 1890, after having reconnoitred about 25,000 square miles of country on the Persian frontier. The preliminary survey of Upper Burma was continued by two field parties under Major Hobday and Lieut. Close, R.E., chiefly in connection with military and exploring expeditions, while Captain H. M. Jackson and Mr. M. T. Ogle, who were attached to the Commission appointed to demarcate the boundary between Burma and Siam, succeeded in mapping an area of 9620 square miles of hitherto unknown country. Mr. G. B. Scott accompanied an exploring expedition towards the Shan States of Baw, Yatzaik, &c., and sketched an area of about 350 square miles of country in Ye Yaman, a wild township of Kyaukse district, south-east of Mandalay. The remainder of the district is a level tract interspersed with low hills, or group of hills, rising from 600 to 1600 feet in elevation. It is separated in the north from the Mandalay district by the Myit-nge river, which, after a long and tortuous course among the mountains, here enters the plains, and, taking a westerly course, falls into the Irawadi about 20 miles lower down. The river is from 250 to 350 yards across, and at all times contains within high firm banks a large volume of beautifully clear water, shaded on both sides by numerous mango groves, among which are numerous villages, with here and there well-built masonry pagodas and

teakwood *zayats*. "Dug outs" are kept at every village along its course, and large rafts of timber and bamboos are brought down from the hills, while it is navigable by small steamers for some distance beyond Ye Yaman. The Panlaung and Zawgyi rivers, draining large areas in the hills, bring down volumes of water sufficient at all times of the year to irrigate fully 500 square miles of country. These canals intersect fully two-thirds of the district in all directions, making communication difficult even on foot across the district. In some places large teak bridges were built before the British annexation, but all other bridges are as a rule mere creaky planks barely fitted for foot passengers, and out of repair. If these were improved travelling would be greatly facilitated; as it is, the traveller must be prepared to wade at intervals knee or waist deep, whether his way lies across fields, along village foot-paths, or even along what in other districts would be called district roads. The irrigated rice-lands cover an area of 200 to 250 square miles, which could be largely extended. The ploughing of the fields is, however, most laborious, the buffaloes, strong and well cared for as they are, having to strain every nerve to drag the plough through the masses of clay in which men and cattle stand knee-deep. The Shan Hills, fringing the eastern limits of the district, are rugged masses, rising in places to 3000 feet. The skirts of the hills are almost bare of soil, and are waterless and rocky. There are vast chasms in several of the summits, forming excellent hiding places for dacoits. Except in the sub-divisional towns the people are almost pure Burmans, with here and there a Shan or half-Shan village. To judge from their every-day appearance, they are neither so wealthy, comfortable, or happy as their brethren in Lower Burma. Yet on festival days they, too, can assume the brightest of holiday clothes and faces. They seem very peaceable, and loud domestic quarrels, so common in Indian villages, are seldom heard. Toddy is extracted from the palm; rice beer is manufactured for local use, but there is little intoxication. The Chinese retail liquor merchants in Kyaukse and other places are forbidden to sell foreign spirits to Burmans, and this order is rigidly enforced. The produce of the rice fields and groves finds a ready market at the railway stations or in Mandalay, and good prices are obtained. From the Shan Hills to the east large droves of bullocks bring down dried leaves for cigars, catechu, and other foreign produce, returning with cloth, &c.

In December 1889 Major Hobday, with one surveyor, proceeded with an expedition despatched against the Kachin tribes south of Bhamo, after which he had to march across a difficult and mountainous country towards Manton, in the heart of the Momeit State, in search of Saw-Yanaing, one of the Chaungwa princes, who had been a fugitive in the Shan states for some years past. At Manton some sharp skirmishes with the enemy took place, but Saw-Yanaing escaped, and so did Kank-laing, another rebel chief whom the expedition vainly endeavoured to capture.

The two columns forming the military expedition to the Chin and Lushai hills, which took place in the cold season of 1889-90, were each accompanied by a small survey detachment. The Burma column, under Brigadier-General Symons, C.B., which assembled at Kan in the Myittha valley to advance into the Chin hills, was accompanied by a party under Lieut. T. F. B. Renny-Tailyour, R.E., and the western column, which proceeded into the Lushai country from Chittagong, by a party under Lieut. W. B. Bythell, R.E. Advantage was taken of every opportunity that arose for extending the topographical knowledge of these wild and difficult tracts, and about 9000 square miles were covered, of which about 5000 square miles were new ground.

The general map of Burma, on the scale of 32 miles to the inch, which was published in a preliminary form in 1889, was completed with hills, and published. It has, however, been decided to bring out a new and better edition, which, in

addition to containing the latest information, will have the hills painted in grey, in order to make the map more legible. A third edition of the 32-mile map of India is in preparation. It differs from the previous editions in being extended both to the east and west, so as to include the whole of Baluchistan and Burma. The skeleton railway maps of India, on the 48 and 64-mile scales, have been corrected up to January 1890. Editions of these, with hills, have been prepared and published, with the hills in grey tint. These two maps will be found useful to those requiring good general maps of India not overcrowded with detail.

A large amount of work was thrown upon the geographical drawing and compilation branch, owing to the complete alteration of the district and *taluk* boundaries by the Mysore Government, and the consequent necessity of revising the whole of the standard sheets of the Mysore Survey.

Among the various pieces of work turned out by the Photographic and Lithographic branch may be mentioned a panoramic profile of the Hill Ranges of the Himalayas seen from Landour, lithographed in colour from a drawing by Major St. G. C. Gore, R.E., and a new military map of India showing the military districts and commands in red.

The great services to photographic science and art rendered by Colonel Waterhouse, Assistant Surveyor-General, have been recognised by the grant of the Photographic Society of Great Britain's "Progress Medal" for 1890, for his "original and continuous researches in relation to orthochromatic photography; for his successful elaboration of a process of photographic etching, and for his recent investigations on the action of thio-carbamides in the direct production of reversed images."

The new drawing-office at Simla, under Colonel Holdich, has been chiefly employed in the preparation of the western sheets of the north-west frontier series and the maps of the South-West Asia series on the 8-mile scale, a task which necessitates great care in the extraction and collation of all information from gazetteers, reconnaissances, reports, and miscellaneous documents.

Our present Knowledge of the Himalayas.

By Colonel H. C. B. TANNER (Indian Staff Corps).

(Read at the Evening Meeting, April 27th, 1891.)

THE paper I am now about to read will, I fear, afford little, if any, new information on the great Himalayan region; but as I have been honoured with an invitation to offer remarks on my experiences and work, extending over a long period of years, on our northern frontier, I gladly subscribe my quota of information to the general store which you have been so long collecting.

These pages are written chiefly from memory, and if from this reason any slight inaccuracies occur, I trust that they may be leniently dealt with. The subject is a vast one, and my chief difficulty has been to sufficiently curtail my paper, so that I may not trespass too long on your patience.

Of the history of Himalayan geographical research I have been

unable to learn much, but as it is probably known to many here present, I pass it over and commence with some remarks on the subject of Snow—the “Him” of Sanscrit—the “Im” of Pliny, which occurs in Imaus, the name by which he is said to have known the Himalayas. Avalanches play a great part in the conformation of the topography—a greater part, indeed, than is generally supposed, and this factor has not received the attention that it deserves at the hands of geologists. If we imagine a great slope scoured for centuries by ponderous masses of snow, which carry down with them all that is movable, we may suppose that the accumulation of the débris at the foot of the slope would present some peculiar features, or, at least, that the piled-up waste of the mountain would exert a noticeable influence on the drainage of the valley into which it was poured, and this we find to be the case. At the base of slopes which receive a large snow-fall there are always fan-shaped, turf-clad declivities, which push the stream over against the opposite side of the valley, where unscalable cliffs are the result. We find in the spring and early summer, after a winter season of ordinary severity, whole valleys lying hundreds of feet deep in snow. Valleys which in summer present rocky beds with precipitous banks, over which it is difficult and laborious to travel, may be passed over as gentle down-like declivities when the snow has sufficiently hardened to bear the weight of man. The torrent may be heard now and then rushing along in its dark tunnel where the snow lies thin, and sometimes a forbidding chasm reveals it if you peer down into the recesses of these dangerous holes. One may travel miles over such snow slopes, treading lightly where you hear the deep hum of the waters very close below your feet, and glissading merrily down where the gradient is sufficiently steep to admit of this pastime.

In the year 1879 I had occasion to travel through Kashmir to Gilgit, and it was my fortune to observe the havoc committed by the avalanches of that year of calamity, when, from the excessive snowfall, the fields of the upper villages were not cleared of snow sufficiently early to permit cultivation. In some places large areas of forest had been levelled and carried along by the snow, and piled up in narrow places into great masses of tree trunks, some whole, others broken into a thousand splinters, but all interwoven in inextricable chaos and confusion. One avalanche, near the well-known hunting retreat of Tragbal, had received such an impetus on the mountain side whence it originated, that it was propelled nearly half a mile through a forest, where the gradient was but slight or almost nil. The giant trees went down before it like grass under a steam roller, leaving here and there only a shattered tree-trunk standing alone.

Between Tragbal and Gurais an avalanche at one place had filled the valley, and on this had been precipitated a considerable landslip with its forest trees. The stream tunnelled a way through the mass, and for two

or three years this icy-walled passage through the snow was the only practicable route up the valley.

Beyond Gurais, and on the Gilgit side of Astor, one of the valleys of Nanga Parbat had been so scoured out by avalanches that the forest lay combed down *longitudinally with the course of the valley*, and this happened at least five or six hundred feet from the torrent, which means that the snow must have made its way along the valley-trough in a mass five or six hundred feet deep. The snow happened to have been arrested at a narrow gorge, which I found quite choked up with tree-trunks, the combined strength of which had arrested its further progress.

I became acquainted with four distinct kinds of avalanche,* which, perhaps, are called by distinctive names by mountaineers, though I have been unable to ascertain them. The first, and the most common, is the precipitation of a mass of new snow from slopes which, from their steepness, are unable to retain more than a limited quantity on them. They occur generally in winter and in early spring, and are the cause of the results just described. The second kind of avalanche is a descent of *old* snow, which is loosened by the heat of the sun. They may be heard throughout the summer and autumn, and are dangerous from the unexpected and irregular manner in which they slide off. The sportsman and traveller should guard against them by intelligently placing his camp in some sheltered spot out of their reach. This class is not usually of any great extent or weight, but such avalanches are of constant occurrence. The third kind can only be seen when the mountains are of peculiar formation or structure, and are really ice, and not snow avalanches. They are of very constant occurrence in some localities, more particularly where small glaciers are situated high up on the crest of mountains, and are gradually pushed over the edge. In Lahaul, in the company of a friend,† we watched the face of the well-known Gondla cliffs from the right bank of the Chandra River, and saw a number of these ice-falls, which came down every few minutes, filling the air with the noise of the loosened rocks and ice-blocks. The fourth kind of avalanche is one that I have only once seen, and have never known described. It is very curious, being the movement of billions of snowballs, which in a stream a mile or half a mile long, I

* Mr. Freshfield sends me the following note on avalanches:—Class 1 are, I think, “Staub-Lawinen,” or dust-avalanches, so called from the snow being less compact, and falling in cloud-like incoherent masses. 2. “Grund-Lawinen,” which fall “im Grund” down to the valley bottoms, or at any rate below the snow-level. 3. Are the summer ice or glacier-avalanches, such as are seen every fine day on the cliffs of the Jungfrau and Wetterhorn. 4. Is a variety of this 3 sort. The “snowballs” are disintegrated névé, that is, snow not yet transformed into ice. The material is not “rolled up into balls,” but broken into balls by the descent. I have seen falls of this kind, and have watched the “balls” play leap-frog over one another often enough. The sound noticed is very characteristic, and not easily forgotten.—D. W. F.

† Sir Benjamin Simpson, who was so fortunate as to secure a photograph of an avalanche actually in motion.

saw slowly wind down the upper part of an elevated valley in the Gilgit-Darel mountains. I was after ibex at the time of the occurrence, and was watching a herd of these animals when I became aware of a low but distinct and unusual sound, produced by a great snake-like mass of snow winding down one of the valleys in my front. It occasionally stopped for a moment, and then proceeded again, and finally came to rest below me. I found this curious movement of snow was produced by countless numbers of snowballs, about the size of one's head, rolling over and over each other. The torrent-bed was full of them, an accumulation formed by numerous similar freaks of nature. I am quite unable to account for such an avalanche as the one now described. How does it originate? or by what process is the snow rolled up into these innumerable balls?

The sportsman, surveyor, or artist, when alone in the forbidding solitudes of the higher Himalayas, frequently hears the rocks grinding their way down from the heights into the valleys, and very often hears avalanches descending, but he sees few. The sound of a falling avalanche may be heard at a distance of several miles, and when he hears one he in vain looks in the direction of the noise. The reason is not far to seek, when we remember that an avalanche takes but a few seconds to complete its course, and that sound travels about a mile in five seconds.

On one occasion it was my fortune to see an avalanche of what I will here name the first class, descend from the upper slopes of one of the Kumaon peaks, about 22,000 feet. Its nose was rounded, and it tore down the steep snowfield at a great pace, sending up a cloud of powdered ice particles behind it; presently, after the snow had lodged in the Karnali valley, the deep roar of the avalanche reached me. In this case I happened to be looking in the right direction, otherwise I should not have perceived the occurrence at all.

We have but few recorded descriptions of Himalayan floods, and these are I think only to be found in Mr. Drew's book on Kashmir,* in which he gives all he was able to ascertain of the most noted of the floods of the Indus. Mr. Drew himself proceeded to the scene of that great flood which in 1841 swept the Indus valley from Bunji downwards, and noted from personal observation the lie of the features in the vicinity of the dam which for six months held the Indus in check. Some years subsequent to the publication of Mr. Drew's work, I had occasion to ascend the range whence the hillside had slipped into the valley below, and I found only a fresh wound on the face of the mountain, with little trace of the dam itself; but during the progress of my observations I became aware that the causes which led to the landslide described by Drew are still to some extent present. Every few minutes, from the slope of Nanga Parbat, just over against my station, rocks and

* 'The Jummoo and Kashmir Territories,' 8vo., 1875, map and plates.

stones were being precipitated into the forest below, which was completely wrecked. The hill sides in the neighbourhood were much cracked, and a second slip on a large scale may at any time occur.

It was in the mountain chain facing Bunji, and close over the right bank of the Indus, that I myself experienced an unusual flood—unusual only because such a one can occur only during the very short period of the year when, on the higher places of the range of mountains, clouds can precipitate anything but snow or hail. It was in August that I was camped in the very deep and precipitous Sai valley, leading from Sai Fort on the Indus to the romantically situated settlement of Gor, on the Dareyl side of the range. At night, after all but myself had retired to rest, a flood of mud, trees, and boulders descended like a thunder-clap on our camp, and in a few minutes carried the camp, trees, and much of our property away; we barely had time to rush up the piles of boulders above the torrent when it was on us, and then occurred such a turmoil of the elements as I shall never cease to look back on as one of the most awful of my experiences. The vibration of the boulders tearing down the valley, carrying with them the trunks of huge trees, was such that we feared rocks might be loosened from the cliffs which towered above us. The blackness of night could nearly be felt, and we had to sit through it till dawn revealed to us a great scene of wreck. Pines of 10 feet girth gone; a great boulder as big as a house, under which generations of shepherds had slept, overturned; and all the bridges between our position and the Indus swept away. The people in the valley below were wakened by the roar of the flood, and feared the worst for us. Such a flood had not occurred within the memory of man. The cause should be borne in mind. At any season except the hottest—the time of my visit—there would have been no rain to cause a flood, but the water which nearly overcame us would have come down quietly as snow, which would have melted gradually and passed off unnoticed, and my proposed journey to Gor would not have been stopped.

It was on my second attempt to see Gor that, passing up the Sai valley in the company of Colonel Biddulph, I visited the crest of that stupendous cliff, which, rising from the right bank of the Indus, faces Bunji Fort. I can only describe the scenery, both of the Sai valley itself, which is exceedingly wild, and of the highlands at its head, as presenting to the traveller the most awful and majestic sight that can be met with in the Himalayas, so far as we are at present acquainted with them; scenery that, from the great heights and gloomy depths which surround you, must move even the most apathetic. Reaching, after passing along a dangerous saw-like edge of rocks, rising from empty space, the extreme south-west corner of the Gilgit Dareyl range, and after ascending the last slope strewn with angular boulders, you find yourself

confronted at a distance of some 20 or 25 miles, with the mighty slope of Nanga Parbat, which rises, from the Indus at your feet, a height of some 24,000 feet to its summit. Facing you stretch the slopes of pure snow, untainted with the dust of the plains. Craigs, serrated ridges, and needle rocks are piled on each other, through which wind many river-like glaciers, and below the snow appear the brown cliffs which flank the Indus valley. The forest-clad tracts are just visible as a well-defined contoured band, growing in a zone between 12,000 and 7,000 feet, and below the latter occurs sparse vegetation and barren gravelly patches. Except the ancient and independent settlement of Gor, at the base of a cliff at your feet, there is no habitable spot visible. From this standpoint the second highest mountain of the Himalayas, the "K2" of the Survey, is seen amidst a wild mass of perpetual snow peaks, themselves so high that the commanding point which dominates the rest loses very much of its importance. Haramosh peak, 24,285 feet high, also forms a conspicuous object of the view, and Rakaposhi is also to be seen.

The height above sea of this point of vantage may be some 16,000 feet, and if one has sufficient nerve one may look down the highest of known cliffs, which descends the first 4,000 feet without a break, and below that, to the Indus, another 8,000 feet past broken crags. This cliff I believe to be by far the highest in those portions of the Himalayas that are known to us from the visits of Europeans, and the exposed mass of Nanga Parbat—a slope of 24,000 feet from base to peak—is pretty certainly the most extensive on the globe.

In a paper written by me some years back, I compared this slope with the exposed portions of other great mountains, and it exceeded the next in rank by many thousand feet.

Distance in Miles (approx.).	Name of Mountain.	Place of Observation.	Height above sea-level.	Amount of slope exposed.
115	Everest	Trigonometrical Station in Dewanganj, 200 feet ..	29,000	8,000
86	"	Sandakphu, 12,000 feet ..	"	12,000
	K ² (Kashmir boundary)	Range between Gilgit and Gor, 16,000 feet	28,278	—
100	Makalu (No. XIII.) ..	Trigonometrical Station in Purneah, 200 feet	27,800	8,000
70	"	Sandakphu, 12,000 feet ..	"	9,000
25	Nanga Parbat, or Deo Mir	Cliff above Gor, 15-16,000 ft.	26,600	23,000
25-35	Tirach Mir (Hindu Kush)	On road from Gilgit to Chitral, 8000 feet	25,400	17-18,000
15	Rakaposhi (Gilgit) ..	Range behind Chaprot (Gilgit), 13,000 feet ..	25,560	18,000
48	Kinchinjunga	Darjiling, 7000 feet	28,160	16,000
(?)	Mont Blanc	Range above Chamonix, 7000 feet	15,781	12,500

With regard to the height of the line of perpetual snow, I have a few words to offer. Various authorities lay down such a line with great assurance, but for myself I find that circumstances of position, of climate, and of latitude, play so great a part in the position of this line that I am unable to define it even approximately. No sooner in one locality, or during one particular season, have I settled, to my own satisfaction, the line of perpetual snow, than I presently have been obliged completely to modify my views on the subject. On page 154 of "English Cyclopædia," vol. v., I read that snow lies 4000 feet higher in the northern than in the southern side of the Himalayas. On page 281, vol. x., of the same work, it is stated that the snow line on the northern slope is at 19,000 feet, which I should have been inclined to say is 1500 or 2000 feet too high. In Gilgit, during the end of summer, I found masses and fields of snow at 17,200 feet, and they extended down the northern slope certainly 2000 feet or even more below that altitude. In Kulu, which has many degrees of latitude less than that of Gilgit, avalanche snow lies in valleys above 8000 feet throughout the year after a good winter snow-fall, but during the past spring, following a very mild winter, I found no snow at all at 8000 feet. There had been no avalanches, and even in June, at 14,000 feet, snow lay only in patches. I think that in determining the snow-line with greater precision than has been done hitherto, scientific men should ascertain those altitudes on which perpetual snow lies on flat places in the position where it first falls, and should neglect the occurrence of a snow-field where it may have been protected from the sun's rays by its position on the north face of a mountain. From memory I can state that there are a considerable number of typical localities which would help out such an enquiry. There is a peak (without name) about 30 miles north of Gilgit, with rounded summit, which, though only 17,500 feet high, is covered with a cap of perpetual snow. In Sikkim, close to and to the north of a point marked Dopeudi on the map, there is a peak of similar shape and height, and this also has snow throughout the year, and these two examples which I here instance, and which I am certain of, differ by eight degrees of latitude from each other. In both cases the snow-cap is exposed throughout the day to the rays of the sun, so that if I am accurate in this statement it is clear that the snow-line must be somewhere *below* 17,500 feet. In Gilgit I was led to consider the snow line at about 17,300 feet, but certainly not *above* that limit.

The important subject of Himalayan glaciers is one that, from personal observation, I have had but little time for studying, and none of my remarks here can pretend to any degree of scientific accuracy. All I can say is that these great frozen rivers have always filled me with a continually increasing wonder and interest, whenever and wherever I have met them. The most extensive and the most picturesque I have seen are in the Sat valley, which drains the southern face of Rakaposhi

mountain in Gilgit. Three immense glaciers come down into this valley, and dispute with the hardy mountaineers for the possession of the scanty area of the soil. Here may be seen forests, fields, orchards, and inhabited houses all scattered about near the ice-heaps. The only passable route to the upper villages in this valley crosses the nose of the greatest of the three glaciers, and threads its way over its frozen surface. This glacier is cut up into fantastic needles of pure green ice, some of which bear on their summits immense boulders. About half-a-mile from its lower end I found an island bearing trees and bushes, and at one place above this a very considerable tarn of deep blue-green water. The glacier had two moraines parallel with each other, both bearing pine trees; and from the highest point reached I fancied I saw the ice emerging from the névé at its source, far away up the slopes of Rakaposhi. In this glacier the pinnacles, wedges, blocks, and needles of ice were of the most extraordinary appearance, and the whole formed a weird and impressive view which I can never forget. Though the largest glacier I have ever approached, it is very small indeed when compared with those described by Colonel Godwin Austen in a locality not very far from the Sat valley. Insignificant though it is, it was more than I could take in during my visit of two days' duration. It struck me at the time of my inspection that the peculiar stratified appearance of the ice needles, which in the case of the Sat glacier is very strongly marked, must have been caused by the different falls of avalanche snow on the bed of névé at the source of the glacier; but the "English Cyclopædia" gives another and perhaps the truer reason for this appearance of the ice.

As the latitude decreases Himalayan glaciers lose much of their picturesque and striking appearance, and, though they may cause a considerable conservative effect, as mentioned by Mr. Freshfield, and though their close study might well repay the scientist, yet to the mere casual traveller the fact, as in Kulu, that they are loaded with an accumulation of dirt and débris renders them no longer objects of more than passing interest. Many glaciers are so buried beneath mud and rocks that the ice is seldom visible, and then only by kicking away the stones.

The lowest glacier I have seen in the Himalayas is one that lies at the foot of the range near Chaprot Fort in lat. $35\frac{1}{2}^{\circ}$, in Gilgit. It is formed of beautiful clear ice and has no dirt.

In Kulu and Lahaul, lat. 32° , glaciers do not come down below 12,000 or 13,000 feet, and all are very dirty, and in Sikkim, lat. 28° or 29° , without having visited the glacier region myself, I should say that the lowest limit reached by the Kinchinjanga group must be considerably higher, perhaps by 2000 feet or even more.

Again, the smallest mountain I have ever met with capable of giving rise to a glacier, is one on the Gilgit-Dareyl range whose height

is 17,200 feet, and in this case the mass of ice formed is of very considerable size.

Of the glaciers round Mount Everest and its great neighbours we know next to nothing, and the little we have learnt is derived from the itineraries of native explorers, who, of all classes of travellers, seem the least capable of furnishing trustworthy information regarding any subject lying at all outside their actual angular and distance measurements. But with my telescope, when employed on the survey of the Nipal boundary, I have gazed long and earnestly at the icy region at the foot of Everest, and Peak No. XIII., where the glaciers extend over a very large area.

Some few years back I was asked to aid in the collection of meteoric dust, by obtaining from an altitude sufficiently high, snow water in which it was hoped that the presence of such dust might be detected; but I pointed out that terrestrial dust is carried up to very great heights, and that it would be next to impossible to obtain the one without the other. During the spring and early summer the atmosphere is so loaded with dust that it sometimes actually rains muddy water, and all the small crevices of the rocks are then full of mud, and snow up to about 19,000 feet is quite discoloured with it. Avalanche snow in the lower valleys after some spring showers assumes the colour of earth, and all appearance of snow is destroyed by the mud. After a shower at an elevation of 7000 feet, I collected a dessert-spoonful of fine mud from a quart of water and sent it to a friend for analysis, but the package did not reach him. I fancy it was merely Punjab mud with a fair admixture of ashes from the forest fires.

This paper, so far, has not touched, except indirectly, on our present knowledge of the Himalayas, and I will now repeat, from memory, as far as I am able, the work that has been done up to date by the various departments of the Government of India. I think that, perhaps, our botanical knowledge is far ahead of other branches of science. Many eminent botanists have been at work for a long time past, and of late Dr. Duthie has been allowed to travel, on duty, into tracts not before visited by any one possessing the requisite knowledge. It is likely that Dr. Duthie's museum at Saharunpur will, within a moderately short time, become an almost complete depository of the chief vegetable products of the Himalayas.

The geologists, Messrs. Blanford, Godwin Austen, Richard Strachey, Stoliczka, and Lydekker, have been pretty well over those tracts open to Europeans, and are now well acquainted with all the leading features of their branch of science presented by the mountains of Kashmir, Kumaon, Kangra, and Sikkim.

The philology of the Himalayas has received considerable attention, but when we find in a circumscribed region like Gilgit no less than five or six distinct languages, it may be surmised that in this direction a

rich field still remains for examination. Colonel Biddulph in Gilgit, and Dr. Leitner elsewhere, have done their share of investigation into the interesting languages of the peoples with whom they have been brought into contact, but it is by no means improbable that along our northern frontier, and especially in Nipal and Bhutan, tribes using a new and distinct language may yet be discovered.

Ornithology has found many votaries, and the birds of these mountains are now probably all or nearly all known, though in saying this I remember that the late Captain Harman, only a few years back, discovered a new and handsome pheasant in the extreme eastern end either of Bhutan or Tibet. The mammals, I suppose, are all known, though one, at least, the Shao, or great stag of Tibet, has not yet even been seen by an European, and the famous *Ovis Poli* has been shot by not more than two or three sportsmen.

Having touched lightly on what has been done by other departments, I will now state the work that has been effected by the Survey of India, to which it has been my privilege to belong for the past twenty-five years. I will begin at the western end, at Rakaposhi peak, which, from my point of view, I regard as the western extremity of the true Himalayas. This great needle, 25,500 feet high, as I have before stated, appears to form a fitting and sufficiently imposing north-westerly termination of the greatest chain of mountains to be found on our globe. It dominates all Gilgit, and Hunza and Nagar as well, and has been largely used by the surveyors, who, with myself, some twelve years ago, made a fairly accurate sketch map of the Gilgit territory.

The Gilgit survey is a continuation of similar work in Kashmir, where a small scale survey was conducted under the late Colonel Montgomerie, helped by a large staff of officers. The maps of Kashmir and Gilgit, without being free from error, are of the greatest use to a large class of officials. Incomplete though they may be, they were not brought up to their present state without taxing to the utmost the endurance of a hardy set of men.

Adjoining Kashmir to the eastwards comes Kangra, with its subdivisions of Kulu, Lahaul, and Spiti. Kangra had once been roughly surveyed prior to the arrival there of my party, who are now at work on a very elaborate contoured map, which will take a long time to complete, owing to the intricacy of the detail demanded.

Between Kangra and Kumaon occur various native states whose territories are being surveyed on the scale of 2 inches to 1 mile, also contoured work, resulting in very elaborate and trustworthy, though somewhat expensive, maps.

Eastward of Kumaon, Nipal stretches along our border for some 500 miles till Sikkim is reached, and eastward again of Sikkim comes Bhutan, and various little-known semi-independent states which lie on the right bank of the Sanpo river; and here again, for convenience sake,

I propose to assign a second limit to the Himalayas. Both eastern and western terminations of the mountains are here assigned in a purely arbitrary manner, and only so that I may define for my own purposes an approximate limit to the tract touched on in this paper. If exception is taken to these limits of the range, where, may I ask, should they be placed? To the westward of Rakaposhi should we include in the Himalayas the Shandur mountains, which approximately extend to the Hindu Kush? or shall we leave the western extremity where I place it? Again, how far to the east of the Dihong or Sanpo River shall we push the eastern extremity? or if such an extension of the chain under one name is objected to, at what point in Bhutan shall we place the eastern limit? And leaving these questions for you to answer, I now proceed with the statement of facts relating to our geographical knowledge, in order, from Kumaon towards the east.

Nipal marches with the Kumaon border for some 120 miles, and advantage was taken of the existence of the trigonometrical stations on the Kumaon hills to extend our knowledge of the adjacent topography of Nipal, and this was done about four years ago with some little result. The more prominent peaks in Nipal within a distance of about 100 miles were fixed trigonometrically, and some slight topographical sketching was done. From the trigonometrical stations near the foot of the lower hills, both in the North-west Provinces and in Bengal, trigonometrical points have lately been fixed, and some distant sketching done in Nipal for 500 miles, between Kumaon on the western and Sikkim on the eastern extremity of this kingdom; and, again, from the trigonometrical hill stations along the western boundary of Sikkim more points and more hazy topography of Nipal was secured. This very meagre topography, sketched from very great distances, comprises all the geography of Nipal other than the sparse work collected by Colonel Montgomerie's explorers, or by explorers trained to his system who have worked since his death. All the existing data, whether trigonometrical, distant sketching, or native explorers' routes, are now being combined, as far as the often conflicting and contradictory materials admit. The resulting map of the country, though at most little better than none, is all we have to expect until some of the strictures on travelling are lessened by the Nipal Government.

The whole of the Nipalese border, which marches with British territory for some 800 miles, is jealously guarded, and no European is allowed to cross it, except when the Resident of Kashmir or his own personal friends are permitted to proceed by a certain and particular route, between the military station of Segowli and Katmandu. The goodwill of the Nipalese is far too valuable to us to risk it in asking too much of them. All we have to do, therefore, is to continue, as far as may be practicable, the fixing, by a trigonometrical operation, of the more prominent peaks visible from suitable points in our own

lands, and a further continuation of the distant sketching of the visible ranges of mountains. Photography should largely be brought into play, for by its means not only, with suitable apparatus, could an approximate measure of angles be secured, but, also—and this is the most difficult part of such work—a correct record of the shape and identity of peaks be obtained, so that, in computing the trigonometrical data the correct angle, as recorded in the field book, might, without doubt, be combined with its pair, obtained in a similar manner from a second point of view.

The difficulties of this class of survey are pretty equally divided between those inherent to the operation and to unfavourable atmospheric conditions. Cloud, mist, dust-haze, and smoke-haze obscure the distant ranges for, perhaps, nine days out of ten throughout the year, and the observer has to exercise the utmost patience when waiting for the few clear periods during which he can distinguish those remote features which it is his duty to lay down by accurate observation with his instruments.

Independent and British Sikkim flank the eastern boundary of Nipal. British Sikkim is a small tract, which has twice been surveyed on suitably large scales, the last work having been conducted by the late Captain Harman, and, subsequent to his untimely death, by myself. Independent Sikkim, which contains Kinchinjanga, one of the highest mountains, and some famous passes has been visited by Sir Joseph Hooker and a few others; and the Jelap, where our forces, under General Graham, have lately been employed, was surveyed in reconnaissance style by Mr. Robert, an energetic and hardy assistant of the Survey of India Department. The sketch map obtained by this gentleman is complete, and similar in character to that of Gilgit by myself, and to that of Nari Khorsam and Hundes by Mr. Ryall. It does not pretend to any exhaustive detail, such as is met with in maps done in the manner of large scale survey where time and money have not been spared, but it is good enough as a traveller's guide, and entailed a great amount of hardship on the surveyor. It is weakest with respect to its boundaries, which is due to a simple reason. The mountaineers who accompanied the survey party in its hasty movement over the country were neither willing, nor able had they been willing, to point out the boundaries of Bhutan and Tibet.

Our knowledge of Bhutan, or, rather, our ignorance of it, is about on a par with that of Nipal, but in Bhutan we have the valuable information left by Captain Pemberton, who forty-three years ago traversed the greater portion of the country from west to east. Besides Pemberton's work, Captain Godwin-Austen, while he accompanied Sir Ashley Eden's mission to the court of the Deb Raja in the year 1863, executed a route survey in Western Bhutan. The engineer officers who were attached to the military force at Dewángiri also did some little topographical work, and beyond this we have distant sketching and a trigono-

metrical survey, as in Nipal, which, also, has yet to be combined with the route surveys of native explorers, some rather recent, and some of old date. The difficulties which are presented to further researches in the direction of Bhutan geography seem unlikely to diminish; in fact, since our war with Tibet, they have sensibly increased, and for some years to come I should think it would be impolitic to send native explorers into the country.

Our knowledge, then, of Bhutan is as unsatisfactory as that of Nipal, and I can see no way of furthering schemes for increasing it beyond an extension of the feeble distant sketching and of the fixing by trigonometrical observation of the more conspicuous peaks.

Eastward of Bhutan occur those numerous semi-independent hill states which sometimes, when necessity presses, own allegiance to Tibet, and at others assert their complete freedom from control. They enjoy such names as Lo, i. e. barbarous, and Lo Karpo, and hold both banks of the Sanpo just outside and north of the Assam boundary. Certain proposals for executing some reconnaissance surveys which would have considerably elucidated geographical puzzles in the neighbourhood of Eastern Assam have been sent in, but owing to political difficulties, which still, I fear continue, they could not be carried out. General Graham's movements towards Manipur are pretty sure to get wind over a large area, and tribes always mistrustful of us will be rendered now even more suspicious than ever. So this tract must also be considered as closed to our surveyors for a long time to come. The only trustworthy work that has been done in connection with the hydrography of the regions north of Sadya still remains to the credit of the late Captain Harman, who, under instructions from General Walker, measured the discharges in cubic feet per second of the Sanpo (Dihong) and of the Dibong. This measurement of the Dibong is pretty well all that is known of the river, for it is lost in a maze of mountain ranges a very short distance north of the low range of hills which lies close above Sadya, and no two surveyors seem to assign to it even approximately the same course. There is much conflicting information at our disposal regarding the course of these two streams, and it is our misfortune that we are obliged to make the best of a very bad piece of work. We are forced to make a map of some sort, and have to construct it of materials that we know to be of more than doubtful value.

The late Captain Harman was more *au fait*, and had more local knowledge of Eastern Assam than any other survey officer, but he was unable before his death to embody in a general form the data which from time to time he had collected. He graphically described the difficulties encountered by the surveyor in the mountains of Eastern Assam, not the least of which were leeches and ticks in countless numbers, to say nothing of tribal treachery and a continual war with the unpropitious weather, which appears to be quite hopeless for eleven months

out of twelve—hopeless to the ordinary tourist, but still more so to those who require a transparent atmosphere to enable them to perform their duties.

The rivers of the Himalayas are so important that the mere passing notice which I have time to give them here seems derogatory to their dignity, and so numerous that I shall merely group most of them into classes of unknown and well-known, giving a slight sketch of those which are most interesting.

Of the former group are the Swat, a branch of the Indus, the Karnali-Gogra of western Nipal, and the great river system of central Nipal, which, issuing from the lower chain of hills near Deoghat, emerges into India as the Gandak; also the important river system of eastern Nipal, the combined waters of which form the calm sea-like expanse in the Kosi of the maps. In Bhutan *all* the rivers can be set down as unknown, except the Lhobrak of Tibet, which emerges into India as a part of those large rivers which united form the Manas of the plains. In the same category are also the streams of eastern Bhutan, which flow into the unknown parts of the Lower Sanpo.

Of those valleys which the survey officers and others have examined, we have learnt more of the main branch of the Indus than of many of its tributaries. It traverses perhaps the wildest parts of the Himalayas, and makes its way, after leaving the inhospitable highlands north of Kailas mountain in Tibet, past the fruit garden of Skardo, through the deep and gloomy gorges of Rondu, and under the great cliff facing Bunji, which it washes for some distance. It then skirts the lofty Nanga Parbat, and has not been seen below this by a European until it reaches the tribal lands where our forces are now engaged with the Miranzais, and where Captain Wahab is at present engaged in pushing his work so as to reduce still further the length of this unseen portion of the river. The affluents of the Indus are perhaps more interesting than the main stream itself, but I now have time to name them; they are, the Cabul, the Swat, the Kunar, and the Gilgit, the last two being the most interesting of the group.

Rivers known almost, if not quite from their sources to the plains, are the Chenab, Jhelum, Ravi, and Beas in the Punjab; the Ganges, Jumna, and Karnali-Sarda of the N.W.P.; and the Tista of Bengal. One of the most trying and dangerous routes that can be travelled over occurs during the last two days' journey up the Ravi, proceeding from the Chamba capital to Bangáhal. The faint indication of a pathway is continually led across the face of cliffs, where the smoothness of the scarp offers but few facilities for placing the naked feet in anything approaching to security, and where often there is nothing for the hand to grasp. The hardy people of the valley have no other means of proceeding on business or pleasure than along this trying goat's path which in some places is so bad that even they, trained though they be from

infancy to climb the loftiest cliffs, enter on the journey with more or less trepidation. One place, in the opinion of the inhabitants the most dangerous of all, and where many have lost their lives, needs some description. It occurs where the sheet slate rock is tilted at a high angle, and across which one has to walk bare foot along the edge of a slight flaw. It may be likened to a mighty billiard table, and the path-way to the almost imperceptible depression where the slates join.

At Bara Bangal village one comes into contact with a people who are almost more cut off from communication with their fellow tribesmen than in any other locality I am acquainted with. To leave their village they must either follow the route towards Chamba, just described, or else cross high snow passes into Lahaul or into Chhota Bangal on the Kangra side of the Dhaola Dhar range. The scenery of this part of the Ravi is some of the wildest in the Punjab Himalayas; in the valley, cedar groves; on the lower slopes the interesting dwellings of the primitive and kindly inhabitants. Huge cliffs, standing smooth and vertical, are backed by lofty peaks of perpetual snow; and below all, the foaming river fills the dark fissure, through which it thunders away towards Chamba.

The Beas, though a small stream, is interesting because it drains the beautiful valley of Kulu and the hills of Kangra, where English men and women live their lives surrounded by their families, in a climate which is sufficiently temperate to admit of long residence without appreciable detriment to the European constitution. The Beas drains none but the smallest and dirtiest of glaciers, but towards the source of the Rupi, the chief branch, there is much picturesque scenery. Near its lower course occurs the ancient and ruined palace of Tira, and the populous town of Sujampur, where the kings of Lambargraon held their court two generations back.

The Satlaj now comes, and is so well known, except in the neighbourhood of the Mansorawar lake, that I need say little about it. A great deal of its course may be travelled, even near its upper portion, with ease and comfort, by using the Hindostan-Tibet road, an engineering work of some magnitude, whence visitors from Simla may enjoy fairly grand scenery. Above Shipki the river traverses the highlands of Gnari Khorsam or Hundes, seldom visited now, but surveyed some years ago by Mr. Ryall in reconnaissance style. I here remark that the moot question as to whether the Satlaj actually issues from the Mansorawar lake or not, does not appear to have been definitely settled, though controversies have been raised on the point, and notwithstanding that more than one Englishman has actually been along the supposed bed as far as the lake.

I will pass on to the Karnali, the Sarda of the plains, which forms the boundary between the British district of Kumaon and Nipal. Few rivers flow through grander scenery than is to be found along

the Karnali Sarda, especially for the last four upper stages. Few villages are more romantically situated than Shangar, Budi, and Garbiáng. None, perhaps, are inhabited by a more interesting people; and nowhere is such an irksome and almost dangerous road to be encountered than the Nirpania-ki-danda stairways, which for miles have been constructed by the villagers up and down the face of the cliffs above the right bank of the river. One of the most facile entrances to Tibet is to be found at the head of this river, where, by the Lipu Lek pass, some 16,500 feet in altitude, traders carrying borax, wool, and rice travel between the large Tibetan town of Tákla Khár and India.

By exercising cunning, and by adopting a ruse, this pass may still perhaps be crossed, when the traveller will be rewarded by a peep at Tibet, where the scenery and the people may be put down as typical of all the land north of the Himalayas, from Changchenono on the one side, to Chethang in longitude 92° on the other; but as long as the irritation caused by Tibetan reverses in Sikkim shall continue, so long will this route be vigilantly guarded by the Jongpen at Tákla Khár, and even by our own friendly subjects at Garbiang, who have a distinct understanding with the Tibetans that, in consideration of trading facilities being allowed them, they shall promptly give notice of the intended visit of any European, so that his passage over the Lipu Lek and other pass shall be prevented by the Tibetan authorities. In my case, though I started from my bivouac at the foot of the pass long before the first streak of dawn, the foot-marks in the snow showed how two runners had preceded me, and the Tibetan functionaries were still in time to prevent me entering the town of Tákla Khár, and I had to remain some two miles outside, in anything but a pleasant locality.

The Bheri, which is the eastern and larger branch of this river, has a long course on the map, but we know nothing of it. Eastward from the Karnáli Sárda occurs a larger river, the Kárnali Gogra, which, rising just above Tákla Khár, flows past the shrine of Khojarnáth, in Tibet, and then entering Nipal is not known to us, except from the report of a native explorer, till it reaches the plains of India. In Tibet, the river, where I saw it, was an expanse of shingle cut up by many streams of foaming water. At this place some years ago a number of British officers set the Tibetans at defiance, and pushed boldly over the Karnali Gogra river, halting only when they reached the base of Nimo Namling mountain—an ugly lump without glaciers below 20,000 feet, though over 25,000 feet high. In place of valleys, this mass of apparently solid rock has only deep fissures or clefts on its face, and except that its dimensions are far vaster, is much like many of the hills round Quetta. It has no spurs, and may be called a mountain in its rudimentary stage of formation. I can describe it only as being hideous and devoid of any interest whatever. Vegetation, of course, is next

to nil, for its base even stands at some 13,000 feet. My visit took place in June, which may be regarded as early spring in Tibet, the small patches of wheat round Tákla Khár and Khojarnáth showing only the earliest blades above ground.

A few words now about the Gandak. The splendid array of snowy mountains drained by the Gandak system may be seen to great advantage from the old hill fort of Someshwar on the northern boundary of the Bengal district of Champáran. From the Someshwar hills, which rise at their highest point to a little over 2000 feet, my assistants were able to secure a certain amount of Nipal topography and to fix a considerable number of peaks, but a low range about 20 miles to the north masked all but the snowy range which lay behind it, and no portion of the large streams such as the Buri Gandak, the Seti, the Kali, and Tirsuli Gandak could be seen. The hydrography of this part of Nipal is in considerable confusion, and though we were able to fix with fair precision the upper courses of one or two of these rivers where the great snow-clad mountains give forth glaciers, yet in the lower ranges their courses have been laid down from the route surveys of native explorers only, and as some of these route surveys show a want of completeness in this neighbourhood, the points of junction of the rivers above named remain largely open to doubt. One glance at the tract north of the low range above noted would furnish more geography than could be derived from years work by explorers; yet, I regret to say, access to any point north of the Someshwar range is denied us, and will remain so until by degrees the Nipalese allow us some freedom of movement amongst their hills. It is in the stretch of flat ground below the Someshwar range that the Nipalese entertain distinguished Englishmen with hunting parties, no access to the neighbouring hills being, however, allowed.

Before I close this paper perhaps I may be excused if I offer a few suggestions as to the best routes which should be travelled by those who may be in search for the picturesque. First and foremost I would place the mountains and valleys of Gilgit, where facilities for locomotion are by no means absent, and where nature may be studied in its grandest phases; where the most lofty cliffs rise from the deepest and most gloomy valleys, where glaciers fill all the side depressions of the great ranges, and where rivers and torrents strike the beholder with wonder at their irresistible impetuosity. All the greatest forces of nature are in this land still at work, and may be watched by the intelligent and attentive traveller. Here, also, may be studied, by numerous and diverse examples, the action and behaviour of great masses of snow, and of the largest ice fields to be found except in the Polar regions. Not the least interesting of the lessons that might be learnt are the regularity and precision with which vegetation, whether as trees or only as annuals, is arranged in its own suitable climate. And more, he may see an ancient people who for centuries have remained with respect to many of

their modes of life as stationary as the Chinese. Everywhere in the Himalayas, except in Bhutan and Eastern Assam, he will be treated with courtesy, and even with kindness, if he only to some extent respects the feelings and prejudices of those he employs. I say this from many years experience, gained amongst all classes, from Gilgit to Bhutan; and in all my wanderings—some of them arduous ones—I have found the inhabitants almost invariable in their willingness to assist in difficult times. In Gilgit the most interesting places to myself are, the Sat valley, the Gilgit-Darel watershed near the Sai valley, and the highlands above Chaprot, whence may be obtained the unparalleled view presented by Rakaposhi Needle, 25,500 feet high, and only 25 miles distant. Nanga Parbet may be studied from all its accessible points of view, and by returning to Kashmir via the Mir Malik route, some magnificent scenery will be passed through.

In Kumaon, fail not to travel from Almorah to the Lipu Lek pass, where, round Budi and Garbiáng, you will be rewarded by unusually fine scenery—foaming cascades, vast cliffs, roaring torrents, and very lofty mountains capped with perpetual snow and their sides clothed with lovely forest of the densest growth. From Darjeeling or from Simla travel by easy stages along the made roads, and enjoy the spectacle offered by the varied scenery you will pass through. From Kaugra visit the Rupi valley of Kulu or cross over into Bara Bangáhal by the Thamser pass; but on no account, unless you be a trained mountaineer, attempt to reach that remote village by the Rávi valley. From Kulu visit the easily accessible Rhotang pass (13,000 feet), and if you have time descend thence into the wilds of Spiti and Lahaul. If you have the opportunity, make a point of visiting the Someshwar range of Chumparan, in Bengal, where in clear weather you may see more of Nipal than can be descried from any point along the five hundred miles where that country skirts our own districts. I will close by saying, go by all means into *any* of the high valleys of the Himalayas, whether from Bengal, from the North-western Provinces, or from the Punjab, and whether you have any particular hobby to work or whether you have not, whether you are an artist or only a photographer, or whether you go simply to enjoy life, you will be hard to please if you return without having learnt many new things and without having enjoyed your journey; but if you are so fortunate as to be permitted to enter any tract which in this paper I have indicated as unknown, then, in the interests of science in general, and of this Society in particular, I beg of you first to arm yourself with such instruments and with such learning as may be requisite for furthering our knowledge of the people, and for filling up the many lamentable blanks which still exist on the map of the Himalayas.

As a last word I would say go by all means very soon, before, in fact, all the beautiful trees in the land shall have been converted into railway sleepers; visit the country before the beautiful camping grounds

shaded by trees 500 years old, such as I now show, shall have been improved off the slopes of the Himalayas. The forester is everywhere abroad, and, under orders which he is bound to obey, he spares nothing.

After the paper,

General J. T. WALKER, R.E. :—It is not my intention to make many remarks on the subject of the interesting paper which has just been read to us by Colonel Tanner, giving his account of the physical constitution, the avalanches and glaciers of the great Himalayan regions, because I have no personal knowledge of them, never having visited them; although I have resided for several years on the mountains in the outer ranges at the various sanatoria, I have never had occasion to go in among the glaciers and avalanches in the most interesting portion of the inner ranges. What I wish to do now is to state that of all the officers of the Indian Survey Department, probably no one has had a better opportunity than Colonel Tanner of becoming acquainted with the characteristics of the principal features of the Himalayan ranges. He has been employed on the extreme western ranges, those ranges round Gilgit, and in the vicinity of the peak known by the Trigonometrical Survey as K₂, which is the second highest mountain yet measured on the earth; afterwards he was moved from these regions into the Eastern Himalayas and carried on survey operations on the frontier between Nipal and British territory, where he was in the vicinity of Mount Everest, the highest peak yet determined on the face of the earth; and finally he was employed in the Kulu and Lahaul and other native states round Simla, in what may be considered the Central Himalayas. He commenced his acquaintance with the great ranges to the north of the British frontier during the Afghan campaign of 1877-8, when he was attached to the British army under Sir Samuel Browne, which marched from Peshawar to Jellalabad. When there, after all his regular survey operations had been completed on the spot, he made the acquaintance of a native chieftain, the head of an important district lying between Jellalabad and the southern frontier of Kafiristan, with whose help he crossed the border and got into one of the Kaffir villages, when he unfortunately fell very ill, and had to return. After the conclusion of the campaign he was sent up to Gilgit, with the idea that possibly he might be able to proceed from there to Kafiristan by a more easy and accessible route for Europeans which passes through Chitral. In those days the survey operations had not gone west of the Indus. Gilgit lies to the west of the Indus, but when the survey operations under Colonel Montgomerie were completed, about twenty years previously, the state of the country around was such that it was imprudent for Europeans to visit it. The country was nominally subject to the Maharajah of Kashmir, but his hold over it was slight. By the year 1879, however, the country had very much quieted down, and a British officer, Colonel Biddulph, was resident at Gilgit as British agent on the frontier. Thus Colonel Tanner was able to proceed with ease to Gilgit and commence making a survey of the country, getting to the peaks beyond, and fixing as much as he could possibly see of the great ranges to the west and north. The second year that he was employed there he had completed his field work and was returning to headquarters to bring up his mapping and computations, and had arrived at Lahore, when intimation was received that the tribes round Gilgit had broken into insurrection and surrounded Colonel Biddulph, who was in a very critical position. Colonel Tanner was immediately directed to return to Gilgit in command of a detachment of the troops of the Maharajah, and he relieved Colonel Biddulph very satisfactorily. Thus he has had opportunities of being located for a very long time in a very interesting region, probably the most interesting part of the Himalayan mountains. When his work there was completed he was sent eastward to Darjiling and employed in carrying on a boundary survey

between Nipal and British territory. Here his operations were of an entirely different nature. He was no longer able to go about through the mountains from point to point, but was obliged to remain on or outside the frontier and from there fix the peaks of the Nipal ranges, making sketches, and getting such topographical information as he could. On the extreme left he managed just to push his way into Tibet and went through some most interesting country.

There is only one point in his paper on which I feel inclined to make any objection: I do not know that I quite agree with him in the remarks he makes as to the maps which have been produced of the lower course of the Sanpo river from Chitang, in Tibet, where it is known, to the vicinity of Sudiya in Assam. It is true the map of that region is very rough, and constructed entirely from information supplied by native surveyors and explorers, and the explorers who gave the information were very inferior to our best explorers; but the best explorers would not go into that country, and it is believed dared not do so. Such information as has been obtained has been put together and mapped, and I think it may be regarded as very fairly correct. Colonel Tanner, is very much inclined to discredit it and consider it objectionable. Perhaps he may be right, but it is no doubt better than nothing. We have got all we have the means of getting at the present time, and we are not likely to get better for many years to come, because the country is on the *qui vive* and alarmed at the probability of European aggression. The people would not allow any European to enter it, and it is highly improbable that they will allow even native explorers to do so. I have merely to add that Colonel Tanner has the advantage of being an artist as well as a surveyor, as you will have seen from the pictures which have been exhibited on the screen, and, I should also tell you that he has always been regarded as one of the most valuable officers of the Indian Survey.

Dr. LEITNER: You are too kind in calling on me to offer remarks on this extremely valuable and correct paper; indeed, we are all surprised, not only to have had an evening of instruction, but also one of delight. There is only one point on which I might possibly offer a slight—a very slight—addition to your information, and this regards the rolling mountains to which Colonel Tanner has alluded. I happened to be in these mountains in September 1866, and noticed that as soon as one stone was moved from the path there was a tendency for a number of boulders, stones, &c., to follow. I am not sufficiently a geologist to be able to tell you the reason of a movement which I have not seen in other parts of the Himalayas. In the winter, or rather towards May and June, when the snow melts, the rolling matter comes down rather in the form of balls than in the huge masses such as are seen in Kulu and elsewhere. This circumstance was used by the people of the country in 1866 in order to conceal the path to their little treasure-caves, which I am sorry to say, although they were nominally Mahomedans, contained wine as well as butter; the butter is kept in the form of little dried fingers and the wine is kept in large jars concealed in the mountains. In this and other more important respects, I was just there in time to catch a last glance as it were of their primitive customs. Our allies were very anxious to destroy us then in order that I should not give to the Government of India, or rather to the Government of the Punjab, which employed me, the required information, which was not political by any means, but purely linguistic. One of their little traps was to put on the road, or rather goat-paths, little stones so arranged that the moment you tread on them you bring down the whole mountain side and are in danger of being swept into the wild torrent below. With regard to glaciers I am ashamed to say that not only because of my own ignorance but also because of my wish not to attract the European adventurer to these regions, I have confined myself to purely linguistic information and have not referred to the fact that these glaciers cover layers of gold that is precipitated into the rivers below, from which the natives are perfectly content to wash

from 4 to 8 annas' worth a day. It seemed to me then desirable not to comment on this fact, but now it is too late, as everybody is at liberty to find out that there are immense treasures there, and it is only to be hoped that the European adventurer who searches for gold will also bring with him something more than that desire, and that we may have dawnings of improved civilisation in lieu of what I will not call the particularly gentle, but the natural kind of life that exists there at present. It seems to me that if these matters were absolutely and entirely left to the Indian Government, the dangers of these discoveries would be minimised. I do not know what else I can say except that I for one feel grateful to those regions for having instilled in me for the first time a real love of nature. I have been exploring mountainous countries, north and south, in Europe and Asia, but my love of nature appeared to me obtained from books rather than feeling. I was really attracted to Dardistan, as elsewhere, by a desire to study the people, the languages, the songs, the history, in fact all that concerns the human being generally; but there is no human being, however callous, who would not be converted to the love and worship of nature by seeing those stupendous revelations of herself, which she gives in the regions so admirably described and depicted to-night by Colonel Tanner.

A MEMBER: May I make a remark upon these interesting glaciers on the head-waters of the upper Indus? I think I am right in saying that the late Sir Douglas Forsyth and his expedition in 1873 were the first Europeans to visit these tremendous glaciers at the sources of the upper Shayok, which, taken in connection with the Gilgit watershed, are the largest glaciers out of the Arctic regions, and I think it right to refer to the fact that these glaciers were fully described in the report of that expedition, and also in two books which were published by members of that expedition, the one called 'Kashmir and Kashgar,' the other 'The Roof of the World,' a title suggested by the late Colonel Yule, the most perfect "mer de glace" being pictured in the last book I mentioned.

The PRESIDENT: The very large gathering which has assembled to-night shows us that much was expected by the Society from Colonel Tanner's paper, and I am very certain that the Society has not been disappointed; in fact I hardly think that since I have had the honour to occupy this chair a more interesting paper has been read. Several gentlemen who followed Colonel Tanner have also given us valuable information and I know that it will be your desire to include them in the very warm and sincere thanks you will direct me to give to Colonel Tanner for his most admirable paper.

*Mr. Alfred Sharpe's Journey from Karonga (Nyassa) to Katanga
(Msidi's country) via the Northern Shore of Lake Mweru.*

WE are indebted to Mr. Ottley Perry, F.R.G.S., for the following brief account of an important journey recently performed by Mr. Alfred Sharpe (recently appointed Vice-Consul in Nyassaland) from Lake Nyassa to the chief Msidi in Katanga. The account is taken from letters which Mr. Perry has received from this enterprising and intelligent traveller; and the accompanying map is from a sketch of his route accompanying the letter. A paper which Mr. Sharpe has prepared especially for the Society, and which gives a fuller account of the geographical results of his expedition, has, unfortunately, not yet come to hand.

In the December number of the 'Proceedings' Mr. Perry roughly indicated Mr. Sharpe's proposed route. Altogether this journey from Mandala and back again (including the steamer journey up Lake Nyassa and down again, and the few miles' march at the Blantyre end of the lake, covered 2638 miles. The actual land march covered about 1874 miles.

Leaving Karonga (on the Nyassa lake), in August, 1890, Mr. Sharpe passed through Mwinewanda, Mwenzo, Mambwe, and Fwambo, *en route* for Abercorn (the African Lakes Company's station at the south-east corner of Lake Tanganyika). Thence, crossing the Lofu river, he reached Bwana Teleka's (at the south-west corner of the same lake) via Kabunda. Thence his route lay west to Mkula's, west of which he discovered a salt lake,* which has at present no outflow, although no less than four small rivers—the Chisela (from the north-east), Choma (from the north), Moambezi (from the south-east), and Mkubwe (from the south)—discharge their waters into it. Skirting the eastern border of this lake in a southerly direction from Mkula to Abdallah's,† the traveller reached Nsama's, and, after making a considerable addition to his carriers, crossed the Mkubwe and Kalongwizi rivers (the latter flowing into Lake Mwero from the south-east) on his way to that lake. Innumerable difficulties in engaging carriers for his proposed journey to Msidi's delayed the journey until he reached Nsama.

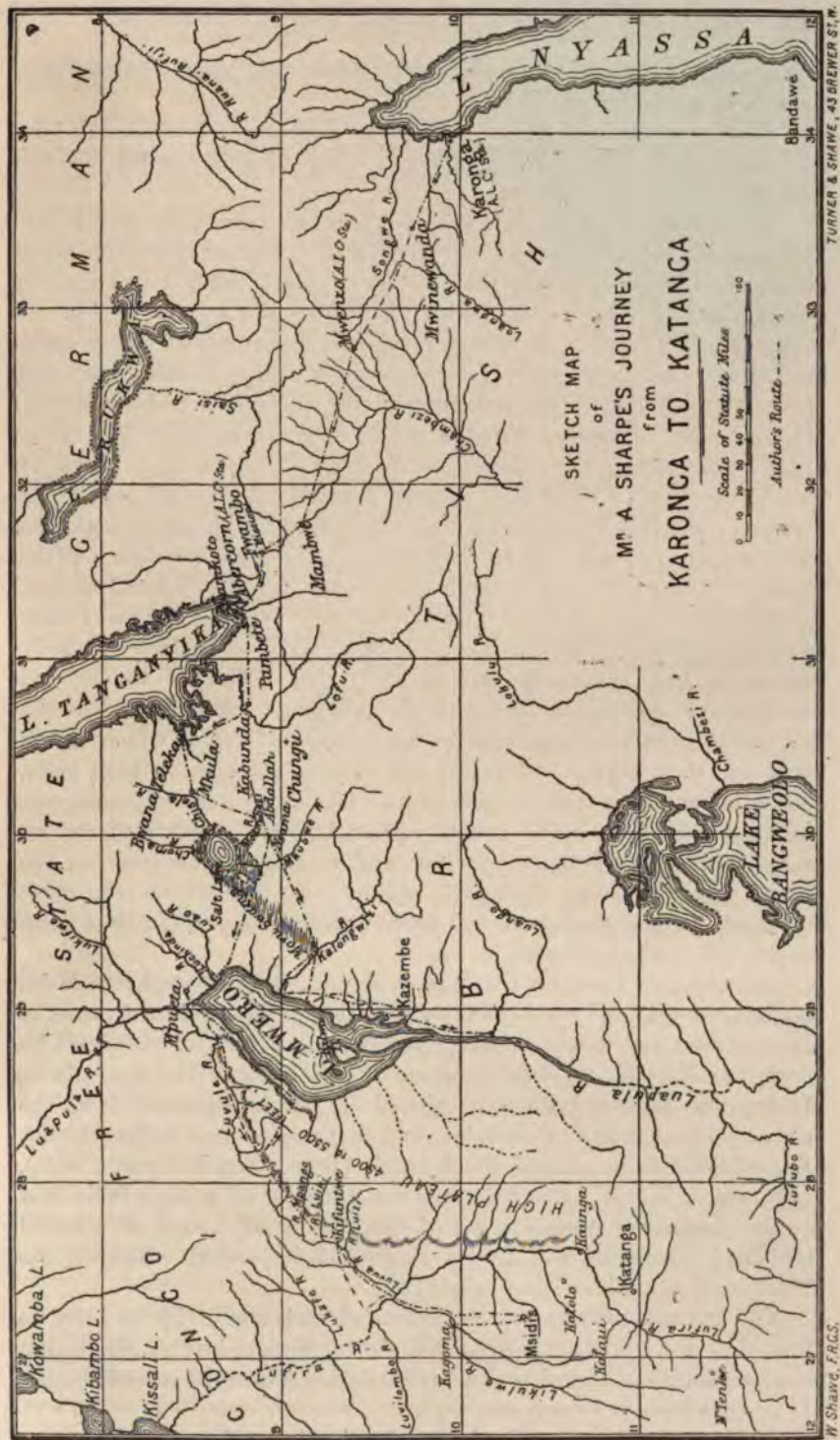
Skirting the eastern shore of Lake Mwero through uninhabited bushland (beyond the Kalongwizi), he reached Kazembe's at the beginning of October 1890, having taken (owing to the circuitous route insisted on by the carriers), no less than eleven days to accomplish the journey between Abdallah's and Kazembe's. Only four Europeans—Lacerda, Gamitto, Livingstone, and Giraud—have visited this chief or his predecessors during the past century.

Kazembe is a great chief, and he prepared himself in grand style to receive Mr. Sharpe. "He was seated on a large box, covered with leopard skin and carried on two poles by twelve men. A band of drums and various musical instruments performed, and men dressed in leopard skins and wearing large wooden masks, skipped around."

In every way except by actual force, Kazembe opposed Mr. Sharpe's proposed further progress towards the country of Msidi, who is his enemy. But although the chief had forbidden his people to sell any food or canoes to the traveller, Mr. Sharpe started on his further journey, taking a southerly direction up the Luapula river (which is here 300 to 400 yards wide). After heroic struggles for three days, during which he was deserted by all except seven followers and passed twenty-four hours without any food whatever, he was compelled to return to

* The lake is indicated as a "marsh," from information obtained by Dr. Livingstone, on Ravenstein's map of Eastern Equatorial Africa, but the river system of the vicinity there laid down proves, according to Mr. Sharpe's exploration, erroneous.—[Ed.]

† Abdallah is a friend and agent of Tippoo Tib. He treated the traveller with hospitality, and rendered him substantial assistance.



Kazembe's. Thence he subsequently retraced his steps to Abdallah's, which he reached about October 16th.

He now determined to pass round the southern end of the salt lake he had recently discovered, and try to reach Msidi's country via the northern end of Lake Mwero.

Mr. Sharpe made an exploration of the southern part of this salt lake on his return journey from Msidi's in December, after the rainy season had set in. It was then a vast swamp between two ranges of mountains, with open water about fourteen miles by ten miles. It appeared, however, to have formerly covered an area of thirty miles by fifteen, with an outlet (now a swampy valley) which ran past Chipimbiro's village to the Kalongwizi river, and thence to Lake Mwero. He succeeded in wading through the swampy fringe of the lake to an island lying about two miles from the edge of the swamp. "As we went," he writes, "the surface (matted vegetable matter and grass) bent in waves like thin ice, so that one almost expected to break through into deep water. At length we reached dry land, the firm sandy beach of the island, which is some eight miles long. Along its shores I found spurs of ground reaching a mile out into the swamp. Never yet have I seen such quantities of buffalo. The flats were *black* with them—literally thousands and thousands—and as they ran before us the ground rumbled like far-off thunder with their gallopings. Among and between the herds of buffalo were equally large herds of zebra, which let us approach them within 100 yards, and then would kick up their heels, canter off, and turn again to gaze at us. Lions also were very numerous (as they always are in this country, where buffalo are plentiful), and we several times heard them growling and roaring in the bush on the island, even in broad daylight. At last we camped on the most northerly point of the island, and here we came on a pool (in the swamp itself) full of hippopotamus."

Mr. Sharpe's route on the journey from Abdallah's station to Msidi lay in a westerly and north-westerly direction to the north-east corner of Lake Mwero, and thence, crossing the rivers Luao and Luchinda (which flow into Mwero), to Mpueta, which is not close to the Luapula as Livingstone supposed when he visited it, but is separated from the river by steep rugged mountains, and is three or four miles distant. Beyond Mpueta he crossed the Luapula (here about 300 yards wide), and turned W.S.W., along the western shoulder of a high table-land (which forms the western coast of the Mwero lake), until he reached the head waters of the Luvua river, and its eastern affluents, the Mpango, the Luiki, and the Luizi rivers.

The Luvua discharges into the Lufira, which is also fed by the Likulwe from the west. After crossing all the above-mentioned rivers, Mr. Sharpe reached Msidi's on November 8th, 1890, having journeyed some 353 miles from Abdallah's in twenty-one days.

Msidi (whose territory is claimed by the Congo Free State) appear

to have deserved the bad opinion entertained of him by his neighbour Kazembe. "He made demands," says Mr. Sharpe, "for *all* my stores of cloth, guns, &c.; but I gave him nothing beyond the present I had brought for him, and before I left, on November 16th (after a stay of eight days), he came to a better frame of mind. He is a cantankerous, suspicious old man, and thinks any one who comes must want to take his country from him. He daily kills many of his people, and his stockade is decorated with heads in all stages of decomposition."

At Katanga, south of Msidi's, the country is known to be rich in copper and gold, and Mr. Sharpe was fully occupied during his local investigations in humouring this crafty and suspicious chief. On November 16th, he turned his face homewards, and travelling north-east by a slightly different route, he ascended the table-land at a point beyond the Mpango river, and crossed it, after reaching a height of 5400 feet, to the south-western shore of Lake Mwero. The table-land appeared to be uninhabited, at least no villages were met with.

The rainy season had set in in real earnest at the end of November, and travelling became very difficult. An excellent view was, however, obtained of the south-western and southern parts of the lake, as the table-land crossed by Mr. Sharpe rises some 2500 feet above the level of its waters. Kilwa is the only island in the lake, situated in the southern part near the mouth of the Luapula, in which river there are other large islands. Kilwa is inhabited by Simba's people, who are at constant war with Msidi's.

"Lake Mwero," writes Mr. Sharpe, "has none of the large extension to the south-west which (by guesswork, I suppose) has hitherto been given to it in maps. From the place where I struck it on the south-west, the shore runs in a nearly straight direction to the mouth of the Luapula." Descending through the forests on the eastern slope of the table-land, Mr. Sharpe emerged on to a wide grass flat by the lake side, and here he met an abundance of game. "The flat was covered with herds of Nswala, a red antelope standing about 12 hands at the shoulder, with harp-shaped horns. There were also quantities of duck, a small kind about the size of a widgeon, excellent eating. Many hippos were snorting in the lake, and snipe got up every few yards through the wet parts of the flat."

The northern part of the western shore of Lake Mwero teems with game, great quantities of buffalo, &c., but elephants are very scarce. The grassy flat did not extend to the north-western and northern shores of the lake, along which is a table-land some 200 feet high and descending steeply to the lake side.

By December 7th Mr. Sharpe had returned to Mpueta, at the north end of the lake, and by December 29th he had reached Abercorn (at the south-eastern point of Lake Tanganyika), and on January 25th, 1891, he returned to Karonga, on Lake Nyassa.

GEOGRAPHICAL EDUCATION: THE YEAR'S PROGRESS
AT OXFORD AND CAMBRIDGE.

The Council of the Society have received the following Reports of the year's progress, from the Geographical Reader and Lecturer at Oxford and Cambridge:—

OXFORD, 12th June, 1891.

To the Council of the Royal Geographical Society.

GENTLEMEN,—The past has been the fourth academical year since the establishment of the Readership in Geography. The progress made during the previous years, and especially during the third, has been fully maintained, and the way prepared for further considerable advances during the coming year.

I have delivered my usual courses of lectures—one lecture a week on historical geography, and one on physical geography, during each of the three terms. The course on historical geography has again been well attended by thirty-three members of the University from eight colleges in Michaelmas term, by fifty-one from eleven colleges in Hilary term, and by twenty-seven from eight colleges in Easter term. As in previous years, the attendance at the lectures on physical geography has been small, varying from two to six members of the University. There must be added to these classes a few members of the ladies' Halls and a few residents in Oxford, unconnected either with the University or the Halls.

In the matter of apparatus, I have used a portion of the grant from the Common University Fund, to which reference was made in my last report, in fitting up my lecture-room so as to provide for the proper display and storage of maps. We have also added somewhat to our collection of maps and diagrams.

I have to speak of two important plans, which will, I hope, greatly increase the utility of our work in the future. I have arranged with certain of the professors and lecturers in the faculty of natural science to deliver my lectures on physical geography during the coming year in the University Museum, and at a time which will suit undergraduates reading for honours in science. The arrangement is less formal than was that with the history lecturers, but I have every reason to suppose that it will result in making physical geography a side-study for our young geologists, zoologists, and botanists. It must be remembered, however, that less success is possible than on the historical side, so far as numbers at least are concerned, because of the relatively small size of the scientific classes at Oxford.

The other is a plan of which I cannot yet speak freely, since the decree which is to put it in force comes before the University Convocation only on the 16th instant. The University will then be asked to give its sanction to an arrangement whereby the Common University Fund

and the Society are each to devote 50*l.* a year for the next four years for the maintenance of a studentship of 100*l.* a year, to be awarded annually to a member of the University who has attended a certain minimum of the Reader in Geography's lectures, and who has fulfilled certain other conditions. The student will be expected to make a geographical study, physical or historical, of a selected region, to visit that region, and to write a thesis thereon. I hope that in this way we may induce a few men to spend a postgraduate year in the study of geography, and that we may be able to mark one of them each year as a specialist, suited to teach geography, or to become a scholarly cartographer. I do not anticipate any serious opposition to the decree before Convocation.*

Thus it seems probable that in the coming year we shall have in operation all parts of the scheme I sketched out in my paper before Section E of the British Association, in 1887. In order to carry it into effect, however, I find it necessary to increase the number of lectures I deliver in the year from forty-two to fifty-six, to give the historical and physical courses in the two winter terms, and to devote the summer term to the more advanced students.

In addition to my work in the University, I have delivered 102 extension lectures to 1700 students in the towns of Kidderminster, Leamington, Newbury, Newport (I.W.), Ryde, Stourbridge, Ventnor, Knutsford, Runcorn, and Shrewsbury. At the Oxford summer meeting I gave a course of nine lectures on the teaching of geography, which was well attended, especially by a large number of teachers who were residing in Oxford for the month.

Recently, at the invitation of the Teachers' Training Syndicate of the University, I have lectured at Cambridge on the "Teaching of Geography."

H. J. MACKINDER, M.A.,
Reader in Geography.

Mr. Buchanan has sent to the Council the following copy of a Report which he has submitted to Dr. Ferrers, the Chairman of the Committee of Appointment at Cambridge:—

CAMBRIDGE, 22nd June, 1891.

DEAR SIR,—During the present year I have lectured in the Lent and Easter Terms. At the beginning of the year I intimated a course of *Physical Geography* and *Climatology*, extending over these two terms. In the Lent Term I proposed to lecture twice a week on the Physical Geography of the Land, having in the previous May Term delivered a course on the Physical Geography of the Sea, and my intention was to complete the cycle by a course on Climatology, in which the physics or Physical Geography of the Atmosphere plays an important part. This programme has been carried out with moderate success. The attendance,

* June 17th. The decree was passed unanimously.

however, is still disappointing. In the Lent Term, when I lectured mainly on the Physics of the Earth's Crust, I had an audience which never exceeded three or four, and it was gratifying to find that they followed the lectures with attention and apparently with interest, which encouraged me at times to give conversational demonstrations with globes and other instruments after the lecture. On the other hand, I was disappointed to find that the attendance fell off when the subject of the lecture had no especial interest for individual hearers. It is this which makes it difficult to go through a systematic course, where, if the subject is treated seriously, there are necessarily portions which are less interesting than others.

In the Easter Term I intimated and delivered a course of six lectures on Climatology. I sent round a large number of circulars to members of the University and others, with the result that the attendance was more numerous, rising as high as thirteen. But here, again, I had occasion to notice that when the subject was in the ordinary sense entertaining, as when treating of the climates of health resorts and the like, the attendance was good; but when the scientific part of the subject was seriously taken in hand, it fell off. At the same time, it may perhaps be said that the attendance in the Easter Term was, on the whole, satisfactory.

I was much gratified that the University was pleased to confer on me the full degree of Master of Arts *honoris causâ* on the 21st May.

I have also much pleasure in reporting that the Museum and Lecture Rooms Syndicate has been good enough to assign to me a room in the new museum, at present occupied by Prof. Newton, as well as the use of the lecture room in the same building. This is a very important matter, as the lectureship will now have a real domicile, which it has hitherto lacked. The room has not yet been handed over to me, but I expect early intimation that I may have entry. It will then be possible to do geographical work, and I hope that some may be induced to devote themselves to this branch of practical research. I am sure that nothing would give a greater stimulus to the study of Geography in the University.

J. Y. BUCHANAN,
Lecturer in Geography.

GEOGRAPHICAL NOTES.

Ascent of Mount Yule, New Guinea.—We learn by a report from Sir W. Macgregor that the exploring party under Mr. G. Belford * has succeeded (on Christmas Day last) in reaching the summit of Mount Yule or *Korio* as Sir William prefers to designate it, and has added much to our topographical knowledge of this part of British New Guinea. The

* Vide 'Proceedings,' *ante*, p. 229.

Yule or Kovio Range was found to be a series of peaks volcanic in their formation, and isolated from the main range of which Mount Owen Stanley is the culminating point. Mount Yule itself again is a peak standing apart from the others of the same cluster. The range of peaks is wooded to the summit, and being below 11,000 feet, is not of sufficient elevation to present that remarkable zone of grassy treeless upland, with clear dry atmosphere, which distinguishes the Owen Stanley Range. Native paths lead to the top, and there are many native villages on the ridges and low country all around it. From the summit Mr. Belford found it impossible, owing to the thick weather, to get a good view of the inland country to the north. On the south-west face of the high western part of the range a magnificent waterfall was seen, with a succession of leaps altogether amounting to about 4000 feet. In the plains to the south-west of Mount Yule a large lake was discovered, varying from three to eight miles in width, and lying between the coast range, not more than 12 miles from the coast and the Yule Range. A large river was also discovered flowing between Mount Drew and the Mekes Range. Animal life was found far from abundant, and the natural history collections brought home by the expedition appear not to be so rich in novelties as was expected.

Mrs. French-Sheldon's Visit to Lake Chala.—Mrs. French-Sheldon, who has made a successful journey to Kilima-njaro, sends us an interesting account, dated Taveta, April 26th, of a visit which she made to the remarkable crater lake Chala, at the foot of the eastern slope of Kilima-njaro. It will be remembered that Mr. New was the first European to visit this lake (in 1871), and although he described the crater as exceedingly steep, and difficult of descent, he managed to reach the edge of the water. He approached the lake from the north, and described it as triangular in shape, surrounded by an almost triangular ridge of hills, rising above the surface of the water to a height of from 150 to 300 feet. Mr. J. Thomson, it will be remembered, on his journey to Masai-land, visited the lake and described its attractions in glowing terms; he, however, could find no place by which it was possible to descend. In November 1886 Mr. J. A. Wray succeeded in reaching the edge of the lake, and the results of his visit were given in the 'Proceedings R.G.S.,' vol. ix. p. 47. Mrs. Sheldon's adventure was undertaken in company with Mr. Keith Anstruther, who some months before had forced a path down to the water's edge. Mr. Anstruther had two sections of a pontoon, across which he proposed to place a sort of raft or platform. With a number of porters then the attempt was made. Mrs. Sheldon went first, and with the utmost difficulty and at considerable risk succeeded in forcing her way through the dense vegetation and loose rocks. Sometimes she sank to her arm-pits into the mass of decayed vegetation, which had accumulated for ages. Multitudes of birds whirled about, and troops of silent monkeys leapt from branch to

branch. Soon, however, she found herself upon "a ragged, rough triangle of tree-trunks and rocks" with the water lapping her feet. Mr. Anstruther and the men followed with the pontoons, which were locked together and set afloat. Mrs. Sheldon and Mr. Anstruther got on board, and with the greatest difficulty persuaded one of their superstitious men to accompany them. Mrs. Sheldon and the man paddled while Mr. Anstruther "kept a sharp look-out for the intrusive crocodiles, which were most numerous." Ducks of three varieties rose in startled flocks from their resting-places. At places the perpendicular rocks which come down from the crest of the volcano could be seen reaching far down below the surface of the clear blue water. Above the water they were densely clad with trees tangled with lianas and alive with birds and monkeys. Mrs. Sheldon noticed a strange under-current in the water that now and again caused waves to rise up, and move forward through the centre of the otherwise tranquil water; yet the air was perfectly calm. Mrs. Sheldon speaks of "the resistance or suction of the water which was felt when the paddles were put two or three feet beneath the surface." This may possibly be accounted for by the action set up by the water, which no doubt comes in from beneath; for there is apparently no supply from the outside. The sounding line carried by Mrs. Sheldon and Mr. Anstruther did not reach the bottom of the lake. The lake Mrs. Sheldon describes as an unequal oblong, the water basin being two miles broad by two and a half to three miles in length; the circumference is about six miles.

The Forests of Zululand.—An interesting and valuable report on the forests of Zululand, by Colonel Cardew, has been issued by the Colonial Office as an official paper. Colonel Cardew's report deals in the first place with the existing state of the forests of Zululand, then with the measures necessary to preserve them, and lastly with the establishment of a staff necessary for the enforcement of the laws and regulations required to effect the better preservation of these forests. As to their general distribution, the forests of Zululand may, Colonel Cardew says, be conveniently divided in the same manner as has been done by Mr. Fourcade, Assistant Conservator of Forests, in his report on the Natal forests; that is to say, into high timber forests, thorn bush, and coast forests. The high timber forests are situated on the Nkandhla and Qudeni ranges of mountains in the Nkandhla district; on the Entumeni and Eshowe Hills and the Ungoye Mountains, in the Eshowe district; on the slopes of the Ceza, and on the Usemi, Empembeni, Makowe, and other hills in the Ndwandwe district; on the VBombo Mountains, in the district of that name. The thorn bush is to be found to a greater or less extent in all the river valleys of Zululand, the timber increasing in size and the bush in density on the lower parts of the rivers, especially in those of the Umkusi and White and Black Umfolosi. It is very large and dense in the country west of St. Lucia

Lake. The coast forests are of no great extent, with the exception of the Dukuduku; they grow in small patches along the streams and rivers near the coast, and especially at their mouths, and also cover the low sand-hills which border the coasts of Zululand. The Dukuduku is situated on the north side of the Lower Umfolosi river in the district of that name; it is several miles in extent and very dense. It was the place of retreat of the coast chiefs during the disturbances of 1888. Dealing more particularly with the distribution of the High Timber forests, Colonel Cardew states that the Qudeni forests clothe the slopes and spurs of the Qudeni Mountain, a magnificent range rising to an altitude of some 4500 to 5000 feet, and situated between the Tugela and Insuzi rivers. The forests are of great extent; in the absence of a survey it is impossible to say what area they cover, but they clothe the southern, eastern, and northern slopes of the mountain, and from their extent and vastness are most imposing in appearance. They are certainly the finest forests in Zululand, and are composed of the most valuable timber, of the same nature and variety as that of the high timber forests of Natal. Yellow wood, both *onteniqua* and upright, abounds, and there is also every description of hard wood, but from want of adequate protection, these noble forests have in many parts been ruthlessly destroyed. Woodcutters do their work in the most reckless and wasteful fashion, and are subject to no sort of efficient control. The district of Nkandhla comprises the long range of mountainous country which forms the watershed between the Umhlatuze and Insuzi rivers; the highest ridge, which attains an altitude of at least 4500 feet, is called Nomance. The Nkandhla forests are of great extent, and are situated chiefly on the southern slopes of the Nkandhla range; one belt of forest, called the Dukuza, is several miles in length, and takes two hours to traverse on horseback. Many are of opinion that these forests are finer than those of the Qudeni. They have not suffered at all from the spoilers in the shape of sawyers, but licensed pole-cutting has been going on to some extent on the Nomance ridge. This pole-cutting is very destructive to forests unless the work is carefully supervised by a Forest Department, and the poles to be cut selected with a view to proper cultural treatment, which has not been the case. The Entumeni forests are situated on the highlands, which rise to an altitude of 2800 feet, between the Mhlatuzi and Matikulu rivers. The timber in these forests is inferior to that of the Qudeni and Nkandhla. The Eshowe forests are not very extensive; they grow in patches on sheltered kloofs and hollows, and along water-courses and streams, filling up the valleys; they are most abundant on the eastern and southern slopes of the Eshowe range. They furnish no hard woods of any value. Next to the Qudeni and Nkandhla the Ingoye forest is the finest in Zululand. It is situated along and on the southern slopes of the Ingoye range, which forms the watershed between

the Mhlatusana and Mlalazi rivers; it grows at an altitude of from 1000 to 1500 feet, and is of great length, extending from 10 to 12 miles. It is a virgin forest in the sense that it has never been cut into by sawyers, but the work of denudation by the natives is very apparent, more so than elsewhere. It is evident from the stumps of trees left, and from patches of wood here and there, that the lower slopes of the Ingoye range were formerly clothed with forests to its base, but gradually by the process of cultivation and wattle cutting the forest line is receding up the mountain. Other patches of forest land are scattered here and there throughout Zululand, but these are the most important forests which call most urgently for some regulation, lest by the joint action of whites and natives they should be to a great extent deteriorated or even destroyed.

The Teaching of Geography.—In a paper on the Teaching of Geography in Schools, by Dr. G. Hirschfeld of Königsberg, in the *Allgemeine Zeitung* for March 10th, the author is of opinion that as long as no special teachers of geography are employed in grammar and other schools, the geographical instruction should be undertaken partly by the teacher of history and partly by the teacher of natural science. He does not hereby mean to recommend the introduction of any scientific “dualism” into the teaching of geography in schools; on the contrary, he claims that geography should no longer be a mere accessory subject in the treatment of history and natural science, but an essential element of both, as without a proper knowledge of the globe nothing in history or science can be fully understood and explained.

Obituary.

Colonel Sir Oliver Beauchamp Coventry St. John, R.E., K.C.S.I.*—The news that this officer died at Quetta on the 3rd. inst. of pneumonia, following an attack of influenza, will have surprised, as it must have distressed, his many friends and all who were interested in his notably active and promising career. Son of the late Captain St. John, of the Madras Army, and born at Ryde, in the Isle of Wight, on the 21st March, 1837, he had at the time of his death but recently entered the fifty-fifth year of his age. Trained for the military profession at the East India Company's Military College at Addiscombe, he received his first appointment to the Bengal Engineers on the 12th December, 1856, his lieutenant's commission dating from the 21st August, 1858. After more than four years' Indian experience, gained chiefly in Oudh and the North-west Provinces—where he served in the Public Works Department—he volunteered, and was selected for special work in Persia. The need of telegraphic communication between England and her Indian Empire had at this particular time become matter of serious consideration, and Patrick Stewart, a young officer of Bengal Engineers, some six years senior to St. John, had been nominated to the charge of an expedition of which the object was threefold:—

* By Major-General Sir Frederic Goldsmid, K.C.S.I.

1. To lay a cable in the Persian Gulf. 2. To take up the cable communication by a land line of telegraph in Asiatic Turkey, with its terminus on the Bosphorus, and 3. To supplement the Turkish posts and wires by an alternative line in Persia. Stewart, assisted by his colleague and brother engineer Champain, having broken ground in the latter country by a personal preliminary survey of the highway leading from the shores of the Persian Gulf to Tehran, Lieutenants St. John and Pierson were directed to join the Persian section of the expedition under Captain Murdoch Smith, R.E., and accordingly these officers proceeded via Bombay to the Persian Gulf, and disembarked at Bushahr. The first-named at once took charge of the fifth and last of the telegraph divisions, considered by Colonel Stewart to be the most difficult and important of all. At a later date, or from December 1865 till June 1866, he had charge of the Director's office, and from March 1866 to January 1867 his own immediate superintendence extended over the whole line from Tehran to Bushahr. During this period a second wire was attached. Proceeding home in May 1867, St. John was then despatched to Abyssinia to organise and take charge of the field telegraph and army signals required for service during the war. The telegraph was on this occasion carried 200 miles from the coast under great difficulties; and the organising officer, besides being mentioned in Lord Napier's despatches, received the thanks of the Government of India, and was recommended to the Commander-in-Chief for a brevet majority on attaining the rank of captain. At the close of 1868 he returned to Persia, the scene of his former labours, and here he remained for three additional years, rendering services to which may be fairly attributed not only much of the success attending the Russo-Persian line of telegraph, but indirectly also the good name enjoyed by his countrymen in the southern part of the Shah's dominions.*

In October 1871, Major St. John was ordered to Baluchistan, to complete the survey of the Perso-Kelat frontier, as provided for under the British Commissioner's settlement of the 4th of September. He returned to England at the close of this essential and delicate task in October 1872, when he was employed at the India Office in preparing maps of Persia and Persian Baluchistan. These, it should be noted, were based on longitudes of the principal Persian telegraph stations fixed in co-operation with General Walker of the Indian Trigonometrical Survey, Captain Pierson, R.E., and Lieut. Stiffe, I.N., by whom time-signals were exchanged between Greenwich and Karachi on the one hand, and the stations in Persia on the other. One of the fruits of the Perso-Kelat frontier survey was St. John's 'Narrative of a Journey through Baluchistan and Southern Persia,' published in vol. i. of 'Eastern Persia' (Macmillan, 1876). This exceedingly valuable contribution to geography deserves to be better known than is likely to be the case, so long as it is only to be found in connection with the useful but costly publication in which it originally appeared.

On his return to India in 1875, Major St. John was appointed Principal of the Mayo College at Ajmir, an office which he retained until August 1878, when he was attached to the Staff of Sir Neville Chamberlain's mission to Cabul. He was afterwards chief political officer to the Kandahar Field Force and Resident in Kandahar, and in April 1881 officiated as Agent to the Governor-General in Baluchistan. During his sojourn in Southern Afghanistan, an attempt on his life by a fanatical native was happily frustrated. The later record of his services shows him to have been employed on special duty in Kashmir in January 1883; acting Resident in

* Major St. John's services in the Persian telegraph are recorded in some detail in 'Telegraph and Travel' (Macmillan, 1874), from the appendix to which volume much of the above information has been obtained.

Haidarabad from April to July 1884; Resident in Kashmir in August 1884; Agent to the Governor-General at Baroda, December 1887; and Resident in Maisur and Chief Commissioner in Coorg, January 1889. The recent departure of Sir Robert Sandeman occasioned his recall from Southern India to Baluchistan, and resumption of the duties of political agent in the latter State; and it was when occupying this responsible position that we hear of his death at Quetta.

The importance of the work entrusted to his hands, and the varied character of the appointments which he held in his later years, bear ample testimony to the ability and acquirements of the deceased officer. To the service which he rendered in Persia, both to Her Majesty's Government and the Shah, the present writer can speak from personal knowledge. His knowledge of the language and ways of the *grandeos* and people, combined with his tact and social powers, constituted him an excellent representative of his countrymen in whatever locality employed; and though the urgency of his presence at Kandahar forbade his ever joining the appointment, he was officially nominated consul for the provinces of Astarabad, Gilán, and Mazandarán, when the expediency of such an office was first recognised.

To soldierly qualities in the field he added the courage and skill of the Oriental sportsman, and the tastes and capabilities of the naturalist and scientific traveller. In his introduction to the 'Zoology of Persia' (Macmillan, 1876) Mr. W. T. Blanford acknowledges the value of contributions made to his collections by Major St. John, whom he accompanied in his journey from Gwádar to Tehran in 1872. Later on, in his handsome and interesting volume, the same writer interpolates a stirring narrative, in St. John's own words, of an adventure with a lioness. But while on this theme I can perhaps do no better justice to a distinguished officer's memory than relate how, in the early part of his Indian career, he saved the life of a comrade from a tiger. The narrative has been kindly placed at my disposal by the rescued officer himself, Lieut.-General Brownlow, of the Royal Engineers, and these are his *ipsissima verba* :—

"In March 1863, we were encamped together on the banks of the Jamna in the Saharanpur district of the North-west Provinces, when a villager came in to inform us that a tiger had established himself between the village and the river and that no cattle could be watered until he had been driven off. The wells in that part of the district, immediately underlying the Siwalik Range, are very deep and cattle must be watered at the nearest ghât on the river. We had no elephants with us, but having each of us already shot his tiger on foot, we felt pretty confident of our straight shooting and perfect confidence in each other, so very soon decided to have it out with the tiger. He had been much worried and irritated by a running fire of clods and boulders which had been kept up on him for some time by men and boys from trees and hiding places at a safe distance from his lair, and was growling and snarling most viciously as we came up to the spot where he was lying concealed under a thick 'elephant creeper' in the centre of a comparatively open space of ground. It was impossible to see him from the side on which we approached, but we were told that we could see him from the opposite side, and in working our way round through thorny jungle, I got entangled in it and had some difficulty in extricating myself. St. John, who was in front of me, had not noticed the delay on my part and was, so far as I can remember, about forty yards ahead of me when I had freed myself from the thorns. Just then St. John came in full view of the tiger, and calling out to me, fired into him, evidently hitting him hard, for out he charged, flashing across in front of me, close to the ground, going straight for St. John, and looking as he went about double his real length, and a quarter of his true height. I got a capital cross shot and put a couple of bullets in behind his shoulders. I found the bullet-holes in his skin afterwards. St. John also fired again and broke his jaw on one side.

The tiger stopped short in his charge, drew himself up to his full height, looked round for a second or two and then two or three easy bounds brought him on top of me. I had already reloaded one barrel but had not had time to cap it before he had knocked me down, crunched my hand, and then got hold of my right knee, shaking me as a dog would a rat. This is very confusing, and I have no clear idea of what was going on around me beyond hearing a shout from St. John followed by a heavy crash on the tiger's head. What really happened was that when St. John saw the tiger worrying me he dashed in to the rescue with clubbed rifle and actually hammered the brute off. When you think what a terribly dangerous brute a wounded tiger is, I venture to maintain that few men have ever performed a more fearless and dashing act of gallantry and true-hearted friendship than that by which Oliver St. John saved my life. The tiger was evidently desperately wounded, for he went off some little distance, lay down under a tree, and too sick to rise again, was 'slated' by matchlock men from neighbouring villages until his skin looked something like a sieve."

Sir Oliver St. John had been a Fellow of the Royal Geographical Society for some twenty-four years, and was the author of a paper published in the *Journal* in 1868, "On the Elevation of the Country between Bushire and Teheran." In addition to his map prepared for Government, he has done much to illustrate the geography of Persia by official and non-official notices of that kingdom and the neighbouring tracts.

COUNCIL MEETING.

ELECTIONS, 1st June, 1891:—

A. Douglas Ainslie, Esq.; Ernest Fitzroy Ames, Esq.; Rev. W. A. Elmslie; Henry T. C. Knox, Esq.; Colonel H. C. B. Tanner (Indian Staff Corps).

PROCEEDINGS OF FOREIGN SOCIETIES.

Geographical Society of Berlin.—May 2nd, 1891: Dr. W. REISS in the Chair.

PROFESSOR FÖRSTER ON THE UPPER STRATA OF THE ATMOSPHERE.

Professor Förster read a paper on this subject. He began by saying the earlier conceptions of the height of the earth's atmosphere were based mainly upon observations as to the duration of the twilight, and as to the extent to which the light of the heavenly bodies was refracted. On the basis of such observations, the height of the atmosphere was estimated at from 40 to 50 miles; it was not, however, by any means thought that, above these altitudes, there were no other strata belonging to the earth, but only that the density of the latter was too small for them to produce the optical effects just specified. The discovery of a means of determining the existence of such extremely thin strata beyond a height of 50 miles dates from the end of the eighteenth century, when attempts were first made to measure, according to Cladni's principles, the heights at which the first illumination of falling stars takes place. A specially comprehensive investigation with reference to these heights was carried out at the instance of the Berlin Observatory in August 1867, by means of simultaneous observations in the neighbourhood of Berlin, with the result that not one of the altitudes at which illumination

commences, and which were measured with sufficient accuracy, was found to exceed practically 100 miles. These results, however, possess only a relative value, being valid only for the falling stars of the month of August, the so-called Perseides; for it is evident that illumination will arise earlier or later, and at different altitudes, according to the varying velocities with which the small heavenly bodies penetrate the atmosphere. Illumination will take place earliest in the case of those falling stars which move in a directly opposite direction to the movement of the earth, which travels at about 19 miles per second. These heavenly bodies, possessing a velocity of their own of about 26 miles per second, consequently enter the earth's atmosphere with a velocity of 45 miles, while in the case of those bodies which tend to be overtaken by the earth in their movement round the sun, the velocity can, in the most extreme case, only be equal to the difference between the two velocities above-mentioned, viz. seven miles. The altitudes at which extinction, that is to say, the almost complete dissolution of these heavenly bodies, commences, vary very much, because the rapidity of the extinction is dependent upon the size and composition of the bodies themselves. The Berlin observations of 1867 gave for this an average height of about 50 miles. From these observations as to falling stars it is also supposed that the boundary between the strata which participate in the earth's movement and those which resist it, should be fixed at least at some miles higher than 100 miles. It is here also that the bodies become heated prior to their illumination. The polar lights extend to still greater altitudes; their height, at the time of their greatest development, when they are visible as far as the tropics, would be from 300 to 375 miles, while in the polar regions they spend themselves, as a rule, at a height of only a few miles, indeed quite close to the earth's surface. But there remains the question whether at those altitudes there are still strata which follow the movement of the earth round the sun; for it is possible that the phenomena of the electric glow, which the polar lights may be considered to be, radiate from the earth into the heavens, follow also the earth's movement round the sun, but at the same time extend beyond the strata belonging to the earth into the strata of extremely rarefied gases, which in all probability fill up the space between the planets and the sun. This space may be designated as the "Himmelsluft," and is not to be confounded with the so-called "ideal medium," viz. ether, in which luminous phenomena are supposed to occur. Evidence in support of the existence of such a "Himmelsluft" is to be found in the conditions existing on the sun, which are gradually becoming more completely known. On the sun, gases are continually being developed and given off as the result of explosive processes as well as of the dissolution and volatilisation of the numerous small meteoric bodies which are incessantly hastening to the sun. Further, the movement of Encke's comet, which in its return, occurring in periods of 1200 days, remains longest in the vicinity of the sun, has furnished important evidence of the obstructive effect of a so-called "Himmelsluft." The movements of other comets and of the planets have not yet afforded evidence of such an influence, but it must be borne in mind that the perceptibility of such an effect depends not only on the density, which increases towards the sun, of those strata of the "Himmelsluft" in which these movements take place, but also on the proportion which the surface of the heavenly body in question bears to its mass. This proportion is very much greater in the case of comets than in the case of planets, and may also in one comet be much greater under certain conditions than in others. Indications of the counter-influence of the relatively quiet "Himmelsluft" as compared with the earth, which rushes through it with a velocity of about 19 miles per second, can be recognised in the highest strata in the case of the movements of the luminous tails and clouds of light which many falling stars and fireballs leave behind them along their flying course, that is, when these remain

visible for some minutes. The changes of position and form, which proceed apparently very slowly in these luminous forms, due regard being paid to their great height and distance from the observer, are supposed to be executed with a velocity of more than 60 yards a second. The movements which take place in these meteoric tails are, according to all appearances, not so simple that they can be explained merely as being the result of the highest strata being left behind in consequence of the velocity with which the observer on the earth's surface is being whirled along, and which at the equator amounts to 17 miles a minute, and at our latitudes to about 11 miles a minute. The very considerable alterations of form which these tails undergo in shifting their position, point to very complicated conditions of movement. But the counter influence of the "Himmelsluft," as compared with the movement of the earth round the sun, is a necessary consequence, not only of the movements in the highest strata of the atmosphere, but also of the effects of pressure, which could not remain unnoticed in the case of very delicate barometrical measurements. If the daily period of fluctuation of the atmospheric pressure were not influenced by so many different factors—for example by the daily warm period and, theoretically at least, by a certain operation of ebb and flow caused by the sun and the moon through their powers of attraction in the atmosphere as well as in the ocean, and perhaps also by the electrical conditions of the atmosphere—there must be, at that time of day at which a given station arrives, in consequence of the earth's rotation, on the front side of the mighty "vessel" which transports us round the sun with a velocity of 19 miles a second, a somewhat greater atmospheric pressure. This time of day is, as a rule, between midnight and midday. In the polar regions the state of affairs is a little more complicated. In these zones an observer can, during the winter, for a longer or shorter period according to the geographical latitudes, remain on the front side of the earth, while in summer he finds himself turned over on to the back of the earth, viz. on that side which is away from the direction of movement. In lower latitudes the mercury in the barometer must always stand higher during the morning hours than during the rest of the day. In consequence of the collective effect of the various factors which influence the daily period of the pressure of the atmosphere, the result is a very complicated one. Within the last five or six years a group of phenomena has arisen, which is of the greatest importance in considering the problem of the conditions in the upper strata of the atmosphere. The last of the series of phenomena connected with the Krakatoa eruption, are the so-called luminous clouds, which have since that time been observed during the night in the summer months on both hemispheres at a height of about fifty miles. These clouds consist obviously of the smallest molecules of water, which have been projected to their highest point, and which during the summer nights have reflected down upon us from that great height the direct light of the sun. The long duration of this phenomenon makes it a very remarkable one. During the last two years, for which very accurate photographic determinations of altitude are available, the average height of these clouds has not altered. This can only be explained if we suppose the existence in those altitudes of an opposing force, which nearly overcomes the influence of gravity, in consequence of the giving off of electricity. In the last few years not only has the density of this collection of matter been very materially lessened, but its geographical and periodical distribution over the different regions of the globe has become more restricted and regular. In Germany these clouds have, during the last three years, only been seen between the end of May and the end of July, towards the north, at a distance of from 310 to 435 miles; on the southern hemisphere, at the southern extremity of America, only during the local summer (December), and then towards the south. It may, therefore, be supposed that this collection of the smallest molecules travels every year from one polar zone

of the earth to the other, so that it is found just over that hemisphere where summer is at its height. This periodical movement would be completely unintelligible if the counter-influence of the "Himmelsluft" on those high strata of the atmosphere which participate more or less entirely in the rotation of the earth on its axis and round the sun, did not furnish an explanation. In consequence of the inclined position of the earth's axis and of the counter-effect of the "Himmelsluft," there occurs from June to December a disposition, reaching its maximum in September, on the part of those strata, to travel from the northern to the southern hemisphere; while from December to June the reverse is the case. It is calculated that for such a periodical journey from pole to pole an average velocity in the north and south direction, or *vice versâ*, of only little more than a yard a minute is necessary, a rate which is quite insignificant when compared with the velocity of 19 miles a second, with which the relatively quiet "Himmelsluft" operates on the upper strata of the atmospheres which move with the earth. Extensive investigations and measurements are still needed in order to arrive at a result in this matter, and it is only by means of the fullest co-operation of numerous observers in all parts of the world that the necessary data for this purpose will be obtained.

Dr. Ehrenreich then gave a description of the country and people in the sertão of Matto Grosso and Goyaz.

NEW GEOGRAPHICAL PUBLICATIONS.

(By J. SCOTT KELTIE, *Librarian R.G.S.*)

EUROPE.

Baedeker, K.—Southern Germany and Austria, including Hungary, Dalmatia, and Bosnia. Seventh edition. Leipsic, K. Baedeker, 1891: 12mo., pp. xvi. and 495, maps and plans. Price 8 marks. [Presented by Messrs. Dulau & Co.]

——. Switzerland, and the adjacent portions of Italy, Savoy, and the Tyrol. Fourteenth edition. Leipsic, K. Baedeker, 1891: 12mo., pp. xxviii. and 498, maps and plans, &c. Price 8 marks. [Presented by the Publishers.]

[**Balearic Islands.**]—Die Balearen. In Wort und Bild geschildert. Siebenter Band. Die eigentlichen Balearen. Leipzig, F. A. Brockhaus, 1891: large 4to., pp. 463. [Presented by the Author.]

This is a further instalment of the magnificent work on the Balearic Islands, by the Archduke Ludwig Salvator of Austria. The present volume continues the description of Minorca, and is, as is the case with the previous volumes, handsomely illustrated with wood engravings and coloured plates.

ASIA.

Iedina, Lieutenant Leopold [von].—An Asien's Küsten und Fürstenhöfen. Tagebuchblätter von der Reise Sr. Maj. Schiffes "Fasana" und über den Aufenthalt an asiatischen Höfen in den Jahren 1887, 1888, und 1889. Mit Illustrationen und einer Karte. Wien und Olmütz, Ed. Hölzel, 1891: imp. 8vo., pp. xii. and 732. [Presented by the Publisher.]

The object of this volume is to give Austrian readers an account of a journey of the young Archduke Leopold Ferdinand along the Asiatic coasts, during the years 1887-1889, on board the Austrian man-of-war *Fasana*. Although the volume is chiefly written with this special purpose, yet several of the descrip-

tions in it are not without geographical interest and value, e. g. those of the coasts of South and East Arabia and of the Persian Gulf, where places like Makalla, Bushir, Lingeh, and Bender-Abbas were visited and well described. On a short visit like this not much could of course be added to our knowledge of the Indian and East Asiatic coasts and countries, but many of the excellent illustrations which the volume contains, present new and interesting features of Asiatic lands and people.

AFRICA.

Blink, [Dr.] H.—Het Kongo-Land en zijne bewoners. Met een Kaart van den Kongo-staat en angrenzende landen. Haarlem, H. D. Tjeenk Willink, 1891: 8vo., pp. xi. and 195. [Presented by the Publisher.]

The author begins with a historical account of the Congo territory from antiquity till the foundation of the Congo State and the recent Anti-Slavery Congress. He then gives a good description of the coast and of the Congo itself with its principal tributaries. Some remarks are made about the climate and the flora and fauna, and a further chapter is devoted to an ethnographical summary of this part of Africa. The volume concludes with an interesting account of the trade carried on at present on the Congo, and the importance of Banana as the chief trading place near the coast. The map shows the large number of European trading places which exist near the coast, and the author asserts that Dutch enterprise is active, not merely on the coast, but also far in the interior.

Gessi, Felice.—Setti Anni nel Sudan Egiziano. Memorie di Romolo Gessi Pascià. Milan, 1891: pp. xv. and 489, map and illustrations. Price 9s.

Of all the distinguished Italians who have taken part in the affairs of the Sudan, Romolo Gessi deserves the highest place. The zeal he displayed in carrying out Gordon's instructions, the courage with which he undertook the most arduous tasks, and the success he achieved entitle him to rank among the first explorers, with Baker, Speke and Grant, of the Nile sources. His book, edited by his son, is dedicated to the memory of his chief, the late General C. E. Gordon. The preface contains a brief sketch of the life of Romolo Gessi. Born in 1831, the son of an advocate of Ravenna, and a political refugee, he attracted the notice of the English Consul at Bucharest in 1848 by his knowledge of languages, and was engaged as clerk. On the outbreak of war with Russia he entered the English staff corps as interpreter, and rendered important services in the Crimea. It was here that Gessi first met with Gordon and became his friend. After the war he returned to London, and re-embarking for the East, visited the ports of Syria, finally establishing himself at Tultcha in Rumania, where he married. In this city he met Gordon for the second time, the latter having been appointed a member of the International Commission for delimiting the frontier between Russia and Turkey. This accidental meeting of the two friends was destined to influence the whole career of Gessi. In 1873, Gordon was summoned to the governorship of the Egyptian Sudan, and invited him to follow. The invitation was accepted, and the events recorded in this volume deal with the whole period of his service there from his arrival at Cairo in 1874 to his death at Suez in 1881. These were seven years of unceasing activity, service and exploration at Khartum and in the Bahr el Ghazal province, now establishing stations for the Egyptian Government, now fighting the slave-dealers, then again exploring and circumnavigating for the first time the Albert Nyanza, and lastly, quelling a formidable insurrection. All these stirring events are narrated in Gessi's own words with a modesty worthy of the man and the leader he served under.

Geographically, the most interesting pages of the book are those relating to the exploration of Lake Albert Nyanza or Mwuta N'zige as it is otherwise known, for the expedition to this inland sheet of water helped to solve the difficult problem of the sources of the Nile. Sir Samuel Baker had discovered the connection between the Victoria and Albert lakes, and maintained that to the north of the basin of the latter there was an outflow which could only be the Nile of Dufli and Gondokoro. But other geographers denied this, and upheld the view

that the Victoria Nile passed along the north-east flank of Lake Albert without mingling its waters with the latter, and the maps constructed at the time adopted this error. Gordon was therefore anxious to clear up a point of so much interest both from a geographical as well as a political point of view, and sent Gessi to discover the true state of the case. Messrs. Watson and Chippendale had returned foiled in their endeavours to penetrate to this lake basin when Gessi started. A steamboat and four iron launches were placed at his disposal. These he had to transport by means of porters across a most difficult country to Dufli, where they were finally launched. Ascending the river with two boats past Wadelai, he entered the lake, not without a skirmish with Kabarega's men, and navigating to its south end, saw in the distance high mountains, ranged in a semicircle. These were probably Mr. Stanley's Ruwenzori. Having fulfilled the principal object of his exploration, and ascertained that the volume of water furnished to the Nile by Lake Albert Nyanza came from the cataracts he had seen at the end of the lake and from the Murchison Falls on the Victoria Nile, Gessi returned. "What a pity you are not an Englishman," said Gordon to him when the two met shortly afterwards at Khartum. In this sentiment the reader of this volume will probably agree. The map at the end is the first we have seen defining clearly the boundary of the Italian Protectorate in the basin of the Upper Nile, and the watershed between the Nile and the Congo.—[E. D. M.]

Junker [Dr.].—Dr. Wilh. Junker's Reisen in Afrika, 1875-1886. Zweiter Band (1879-1882). Nach seinen Tagebüchern bearbeitet und herausgegeben von dem Reisenden. Mit Illustrationen und 6 Karten. Wien und Olmütz, Eduard Hölzel, 1890: 8vo., pp. xvi. and 560. [Presented by the Author.]

This volume contains the first part (1879-1881) of Dr. Junker's second African journey. From Khartum he went up the Nile and Bahr-el-Ghazal to the Meshra-er-Rek. From there he travelled via Djur Ghattas, Wau, Bizelli and Gando, to Dem Soliman, and then turned south and penetrated right into the centre of the Niam-niam (A-Sandeh) country. He was well received by one of the chiefs, Ndoruma, and afterwards proceeded further south through Semio's, Palembata's, and Nasima's territory, till, in September, 1880, he reached south of the 4th degree N. lat., the great river Welle Makua and the Mangbattu country (Schweinfurth's Monbuttu). He crossed the river and met with a good reception from one of the Mangbattu chiefs, Mambanga, with whom he remained some time. He then proceeded south of the Welle eastward, until he came to a place called Mabub or Seriba Ali, where Schweinfurth had crossed the Welle in 1870, and reached Tangasi and Niangara, a little further south than Schweinfurth's last point. From there he returned to the Welle, and then marched north-east and north, exploring the Duru, Kapili, Mbrule and other tributaries of the Welle. He returned westward to his friend Ndoruma at the end of 1880. In January 1881, he again turned south, and reached the country of the A-Madi, who occupy the bend which the Welle forms at 27° E. long. Travelling westward, he crossed the Welle again near the mouth of the Kumbala, and reached the A-Bambo tribe, where his situation became very critical, as the A-Bambo proved unfriendly and hostile. At last he succeeded in escaping, and returned to the A-Madi on the other side of the Welle.

Meanwhile, an officer of Emin Bey had founded a military station near Mambanga, south of the Welle, and Dr. Junker went there, to visit Captain Casati; an interview which has already been described in Casati's book. Dr. Junker then travelled west to Mamballe, and south to the Niam-niam chief Bakangai, and the river Bomokandi, in about 3° 8' N. lat., localities which are mentioned by Miani and Potagos. At this stage of the journey the volume ends.

This volume is of very great importance for the knowledge of the Niam-niam and Mangbattu countries. Before Dr. Junker's expedition the whole territory south of Dem Bekir (6° 50' N. lat.) was but very imperfectly known from the travels and information of Heuglin, Schweinfurth, Miani, Potagos, and others. Schweinfurth visited only a small part of the Niam-niam and Mangbattu countries, whilst Dr. Junker traversed them in all directions, and carefully ex-

explored the course of the upper Welle and of its chief tributaries. Wide undulating regions, sometimes changing into hills and mountains, or into extensive alluvial plains (in the Bahr-el-Ghazal territory) are the chief characteristics of these countries, with their innumerable rivers, flowing either to the Nile or Congo. The watershed is described as a broad elevation, which indicates a change in the character of the country. The political condition of the natives was, during Dr. Junker's stay, by no means satisfactory. The great Niam-niam nation, once powerful and united, was split up into numerous parties and factions, which were exhausted by continuous internal wars, and a general distrust and uncertainty prevailed everywhere. In the Mangbattu country things were no better. Since the assassination of King Munza by the Arabs the dynasty had lost its unity and power. Cannibalism in its worst forms was a common occurrence, and slave raids were nothing unusual amongst the tribes themselves; Dr. Junker describes it as a great error to assume that the Arabs are the only slave-hunters in Inner Africa. Under these circumstances the Egyptian soldiery had an easy task, but unfortunately most of them behaved in a way which engendered feelings of fear and distrust among the native tribes, many of the Egyptians being indeed as bad thieves and slave-hunters as the professional slave-dealers themselves, whom they had defeated and punished when under the command of Gessi. The latter, whom Junker met a short time before his ill-fated journey on the Bahr-el-Ghazal, is described as a man of great personal accomplishments and bravery, but he was not in every respect a fit ruler of his province, as he was unable to properly organise the different tribes after he had defeated the Arabs in the Bahr-el-Ghazal territory.

The volume contains many new botanical and zoological details as well as valuable information about the prospects which agriculture would offer, Dr. Junker himself having made various practical experiments in connection herewith. He further reports that among the information which he collected about the unexplored regions in the south, he heard of the existence of an enormous forest, which is good proof that Mr. Stanley's great forest is not merely of local extension as has been suggested. Dr. Junker later on touched the northern part of this great equatorial forest, thus further confirming Mr. Stanley's view.

It is marvellous with what a small party Dr. Junker made his way through these savage, cannibal countries, and his diplomatic skill in dealing with the natives is to be admired, not less than his faculty of finding resources where most other travellers would have failed. Many of the illustrations of the book are very good, especially the ethnographical sketches contributed by Dr. Schweinfurth. The six small maps which accompany this volume are excellent and undoubtedly of great accuracy, as Dr. Junker took the utmost care in mapping out his routes, noting bearings, making triangulations, &c., wherever practicable.

F. Bohndorff, who had entered Dr. Junker's service at the beginning of this journey, had meanwhile traversed these districts in various directions; but we need not refer particularly to the details of his travels, as they have been already fully described by Mr. Hassenstein in 'Petermann's Mittheilungen,' 1885.—[H. S.]

Rust, Captain-Lieutenant [von].—Die deutsche Emin Pascha-Expedition. Mit Karte. Berlin, F. Luckhardt, 1890: 8vo., pp. 191.

This volume deals with the first stage of the German Emin Pasha Expedition, of which the author was for some time a member. He describes the preparations and the landing of the expedition at Kwyhoo Bay, the details of which are likewise reported in Dr. Peters' own book. Left in charge of a part of the rear guard, he went up the Tana beyond Massa and Tune, but did not succeed in penetrating farther into the interior and joining Dr. Peters, and consequently returned to the coast. Some of his observations about the tribes near the Tana—especially the Wapokomo and Somali—are new and interesting.

NEW MAPS.

(By J. COLES, *Map Curator*, R.G.S.)

POLAR REGIONS.

North Pole.—Polarkarte zur Übersicht der früheren und heutigen Menschengrenze. Entworfen von Kurt Hassert. Scale 1:30,000,000 or 411 geographical miles to an inch. Petermann's 'Geographische Mitteilungen,' Jahrgang 1891, Tafel 11. Gotha, Justus Perthes. (*Dulau*.)

EUROPE.

Elb und Eider-Mündung.—I. Die Marsch zwischen —, um 1500. II. Eingedeichte Marsch, um 1750. III. Eingedeichte Marsch bis 1890. Scale 1:275,000 or 3·8 geographical miles to an inch. Petermann's 'Geographische Mitteilungen,' Jahrgang 1891, Tafel 8. Justus Perthes, Gotha. (*Dulau*.)

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The title of this map is somewhat misleading, as it is in fact an ethnographical map of Central Europe. It is published for the German School Department with the assistance of Herr R. Böckh, and all the best available material will be used in its compilation.

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This is an edition of Map No. 3 of the Sydow-Habenicht Series of wall maps, which has been specially prepared for the use of English schools. It is orographically coloured, and printed in a bold style, well suited to the purpose for which it is published, and contains a full explanation of the meaning of the colours and symbols used to indicate the different physical features.

Hanoi.—Plan de —, et de ses Environs. Dressé sous la direction de Charles Halais, Ancien Résident-Maire de Hanoi. Scale 1:16,000 or 4·5 inches to a geographical mile. Charles Bayle, Editeur, Paris. Price 3s. 6d. (*Stanford.*)

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Malay Peninsula.—Map of the ——. 1891. Published under the auspices of the Straits Branch of the Royal Asiatic Society. Scale 1:563,900 or 7·7 geographical miles to an inch. Stanford's Geographical Establishment, London. Price 12s.

This is a corrected edition, on which are given the results of all the latest surveys. The political boundaries of British Possessions and Native States are clearly shown, all means of communication are laid down, the localities where gold and tin are found being indicated. A portion of the Siamese Territory in the Malay Peninsula above 8° of North latitude is given on an inset map, as are also plans of the town of Singapore, and George Town, Penang; and the elevations above sea-level, so far as they are known, are given in feet. The map is very clearly drawn, and contains a considerable amount of detail.

Mindanao.—Fluss-und Völker-Karte des mittleren Gebietes der Insel ——. Von Prof. Ferd. Blumentritt. Scale 1:1,000,000 or 13·6 geographical miles to an inch. Petermann's 'Geographische Mitteilungen,' Jahrgang 1891, Tafel 9. Justus Perthes, Gotha. (*Dulau.*)

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CHARTS.

Sargasso See.—Die nordatlantische ——. Nach der Häufigkeit des Krautvorkommen's dargestellt von Prof. Dr. O. Krümmel. Scale 1:31,300,000 or 427 geographical miles to an inch. Petermann's 'Geographische Mitteilungen,' Jahrgang 1891, Tafel 10. Justus Perthes, Gotha. (*Dulau.*)

United States Chart.—Pilot Chart of the North Atlantic Ocean. June, 1891. Published monthly at the Hydrographic Office, Washington, D.C.

[ATLASES.]

Hartleben, A.—Universal Hand-Atlas. 93 Hauptkarten und 100 Nebenkarten auf 126 Kartenseiten zur mathematischen, physikalischen, politischen und historischen Geographie. Mit einem begleitenden Texte und vollständigem Register von Dr. Friedr. Umlauf und Dr. Franz Heiderich. Wien, Pest,

Leipzig, A. Hartleben's Verlag. 1 Lieferung. Price 9d. (*Williams & Norgate.*)

This is the first issue of a cheap atlas, which, when complete, will contain ninety-three large maps, and one hundred insets; these are to be accompanied by explanatory text and a full index. The present number contains a geological sketch map of the World, maps of Upper and Lower Austria, and Roumania, and an ethnographical map of the Old World. The maps are very nicely drawn, and if the first issue may be taken as a fair sample of those that are to follow, this bids fair to be a thoroughly good atlas, considering the remarkably low price at which it is sold.

Stieler's Hand-Atlas.—Neue Lieferungs-Ausgabe von ——. 95 Karten in Kupferdruck und Handkolorit, herausgegeben von Prof. Dr. Herm. Berghaus, Carl Vogel und Herm. Habenicht. Erscheint in 32 Lieferungen (jede mit 3 Karten, die letzte mit 2 Karten und Titel). Dreissigste (30) Lieferung. Inhalt: Nr. 2, Der südliche Sternhimmel. Nr. 59, Iran und Turan, in 1:7,500,000, von A. Petermann. Nr. 60, Inner-Asien und Indien, nördl. Blatt in 1:7,500,000 von A. Petermann. Gotha, Justus Perthes, 1891. Price 1s. 6d. (*Dulan.*)

Sheet No. 2 is a star map of the Southern Heavens. A map of Persia and the surrounding countries is given on sheet 59, and Central Asia and part of Northern India on sheet 60. These maps are all good specimens of cartography, the hill shading is very effective, and the colouring well chosen.

Universal Atlas, The.—Complete in 28 parts, including Index. Published by Cassell & Co., Limited, London, for the Atlas Publishing Company, Limited. Price 1s. each part.

The present issue contains maps of Spain and Portugal; the southern half of England and Wales, and Italy. The map of England and Wales has been specially prepared for this atlas; the others are in all respects similar to those published in the German edition.

PHOTOGRAPHS.

New Hebrides.—53 Photographs of the —, taken by J. W. Lindt, Melbourne, and presented by him to the Royal Geographical Society.

This is an excellent series of photographs of the scenery and groups of natives taken by Mr. J. W. Lindt during his travels through the islands of the New Hebrides Archipelago in 1890. They are intended to illustrate a work, similar to 'Picturesque New Guinea,' which Mr. Lindt intends to publish, and great care has been taken in selecting characteristic subjects.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

PROCEEDINGS
OF THE
ROYAL GEOGRAPHICAL SOCIETY
AND MONTHLY RECORD OF GEOGRAPHY.

Exploration of the Benue and its Northern Tributary the Kebbi.

By Major CLAUDE M. MACDONALD (H.M. Commissioner to the Oil Rivers).

(Read at the Evening Meeting, May 11th, 1891.)

Map, p. 512.

Two hundred and thirteen miles almost due north from the mangrove swamps of the Niger mouth, the waters of the Niger or Quorra are mingled with those of the Benue, or, as it is sometimes called, the Tchadda, or Chadda. By this latter name nearly all old books of travel—Barth, Lander, Burchardt, Laird, Baikie, Hutchinson, &c.—speak of the river which I had the good fortune some eighteen months ago to follow from the confluence to within a few miles of one of the most important and unknown of its sources.

A short history of the Benue may be interesting.

In 1830 Richard Lander and his brother, having struck inland from the coast at Badagrey, reached the Niger at Bussa, and, after many vicissitudes, drifted down that river in a canoe. On the 25th October 1830, they discovered "that the Benue or Tchadda flowed into the Niger."

The first Europeans to navigate this river were Messrs. Laird and Oldfield, who ascended the Benue about 104 miles, as far as Dagbo. The narrative of this expedition is very sad reading. They entered the Niger by the Nun mouth. The expedition consisted of forty-nine Europeans, of whom only nine lived to return. Their outfit consisted of the steamers *Qwara* and *Alburkah*; and they reached Rabba on the Niger, and Dagbo on the Benue. Richard Lander accompanied the expedition, but was shot when returning, by people of the Hugrammah tribe, on the Lower Niger. He died, and was buried in the island of Fernando Po.

The celebrated but disastrous expedition of 1841 was the next attempt to open up the waters of the Niger and Benue. It consisted of the steamers *Albert*, *Wilberforce*, and *Soudan*, and was undertaken under

Governmental auspices, and manned by officers and blue-jackets of the Royal Navy. The first of these steamers reached Egga, on the Niger; but the expedition, after landing materials at the confluence for a model farm, retired with a loss of thirteen officers and twenty-six men. The expedition had only been a little more than sixty days on the river.

In 1849, Mr. Richardson, accompanied by Drs. Barth and Overweg, made an expedition, starting from Tripoli through the Sahara to Damuju, whence they travelled in different directions, making arrangements to have Kuka, the capital of Bornu, as their rendezvous. Mr. Richardson, however, died on March 4th, 1851. Drs. Barth and Overweg met at Kuka, and went in company to Kanem, to the north of Lake Chad. Dr. Overweg, after having circumnavigated the lake and launched a boat named the *Lord Palmerston* at Maduari, died at this place in September 1852.

In May 1851, Dr. Barth journeyed from Kuka to Yola. On June 18th, 1851, he struck the Benue at Tepe, where it is joined by the Faro, which flows from the south; this was the first sight obtained by any white man of the waters of the Upper Benue. Some days later, on the 22nd June, Dr. Barth reached Yola, at which place, however, he only remained four days, being very inhospitably received by the then Emir, Mahommed Lawal. He then returned to Kuka, crossing the Benue at the same place. At this time it was uncertain whether the river which Dr. Barth had crossed was the same stream which had been partially navigated by the expedition under Laird and Oldfield. To ascertain this point, the Admiralty entered into a contract with Mr. MacGregor Laird to build and equip a suitable vessel.

Mr. Laird was possessed of considerable African experience, and took the keenest interest in matters appertaining to this part of the West Coast; he was therefore eminently fitted for planning and arranging all details of such an expedition. The Admiralty instructions were, "first to explore the river Tchadda from Dagbo, as far eastward as possible, and to endeavour to meet and assist Dr. Barth."

This expedition was the most successful of any that had entered the Niger, in that it left it after a sojourn of 108 days without the loss of a single man from sickness; and the river Benue had been navigated as far as Dulti, and its course mapped out. The expedition was ably carried out by Dr. Baikie—a name very familiar at Lokoja to this day. An account of this voyage appeared in 1856.

To come down to more recent times, and the establishment of regular trade on the Benue:—In 1874, the West African Company started purchasing ivory at Bomasha. In 1876, the Central African Company commenced trading operations. In 1879, the West African Company's warehouses were plundered, and an agent murdered, by natives in the Mitshi country, and all European traders left that part of the river. In 1880, the amalgamated firms, called "The United African Company,"

started at Loko. The United African Company proving successful, it was proposed to create a great public company, with a subscribed capital of one million. In 1882 this was done, and the new company was called "The National African Company," and had as its president Lord Aberdare. Almost immediately afterwards, two French houses which had entered the Niger regions commenced strenuous efforts to obtain political influence on the Niger. At the end of 1883, the factories belonging to the French firms exceeded in number, though not in importance, those owned by the National African Company.

Previous to the sitting of the Berlin Conference the French firms had disappeared from the Niger basin, and no commerce existed in the Niger except that of Great Britain; this was due to the skill and energy of the officials of the company, both at home and on the Niger. Amongst the latter stands pre-eminent the name of the late Mr. David McIntosh, a man of infinite resource and indomitable energy.

In July 1886, a Royal Charter was granted to the company, which is now known as "The Royal Niger Company, Chartered and Limited." In 1880, the Church Missionary Society's steamer *Henry Venn* navigated the river as far as Yola. In 1885, Messrs. Wallace and Dangerfield, of the National African Company, established trade at Yola, a trading hulk being moored at that place. The Emir of Yola objecting to this, the hulk is now moored at Garua on the north side of the river. In 1886, the company sent up a steamer to Buhn Jidda for trading purposes; but for political reasons it was withdrawn, and the frontier trading station of the Niger Company is now at Garua, in the Ribago province.

We entered the Nun mouth of the Niger on Wednesday the 24th July, and reached Lokoja, which is situated at the confluence of the Niger and Benue, on the 2nd August.

The scene at the confluence was a very striking one. The waters of both rivers, at the period of my visit, were in flood. As to size and grandeur, and in the volume of water that each river contributed, there was not much to choose between the two; if anything, the Benue was the wider by some 400 yards. From Lokoja—a large and, so far as the native part is concerned, decidedly dirty town—over to where the villages of Igbebe and Gandu line the steep mud-banks on the left or southern shore, is a distance of over three miles.

Lokoja is one of the most important centres of the Niger Company, and they have here large storehouses for native produce, as well as European wares, mostly Manchester goods. Here also they have a considerable force of constabulary. Lokoja will doubtless be a place of very considerable importance in the near future; it is here that the Mahomedan tribes of the Western Soudan, with their powerful Sultans of Sokoto and Gandu, come in contact with the Pagan tribes of the Lower Niger; it is to this parallel of latitude that the Fulbe and their

descendants have driven back the Pagan tribes, burning villages and capturing slaves; and but for the river, which to a great extent forms a natural boundary, and for the presence in force of the Royal Niger Company's constabulary, they would have carried their slave raids to the coast itself.

I had the good fortune to spend several days at Lokoja, and when not engaged in the work of my special mission, inspecting the factories of the company, and holding palavers with native chiefs, both Pagan and Mahomedan, took rambles through the town and neighbourhood, while Captain Mockler-Ferryman, of the Oxfordshire Light Infantry (who was my companion during the four months I spent in the Niger territories), was busy with his camera.

I was accompanied on some of my rambles by a Hausa named Frederick Fowell Buxton Abigai. This man was an astute trader, and a most amusing old rascal; his history was somewhat singular. Originally a Hausa slave, he became as a lad the servant of Drs. Barth and Overweg, and accompanied them on most of their travels. He was taken to England by Dr. Schön, the worthy chaplain of the expedition of 1841, a pious and learned man, author of several standard works in the Hausa language. By Dr. Schön he was baptised in the Christian faith, and returned to his native country, to be, as Dr. Schön hoped, "a worthy instrument for the propagation of the Gospel." On his return, however, he soon became a Mahomedan, and is now the happy, or rather unhappy, possessor (for I believe they lead him a somewhat tempestuous existence) of four wives. He was a most amusing companion, and full of reminiscences of Drs. Barth and Overweg. Though over seventy, he is, as they say, "as hard as nails," a fair shikari, and prepared to do a deal in anything, or with anybody.

The view from the slope of Mount Patteh, at the back of Lokoja, is very fine. The country here has been cleared and put under cultivation, principally by the members of the Roman Catholic mission; the reverend fathers and lay brothers might be seen any afternoon working in the fields. Not many yards from the narrow path which wound through fields of Indian corn and millet towards the mission house, was the little God's Acre of the white man; it is a peaceful spot, and commands a fine view of wooded hill and winding river. Here lie many members of the Niger Company, and a monument sent out by the company has been erected to their memory. Humbler crosses mark the graves of four sisters of the Roman Catholic mission who have laid down their lives in the service of their Master.

Mount Patteh rises 1200 feet above the river, and, like the majority of the surrounding hills, is tabular in formation. The top is an almost level plain, some mile and a half in length and three to four miles in breadth, well wooded, and in the dry season well stocked with deer and other game. The hill itself is wooded to the summit, and commands

lovely views of the surrounding country. On the cultivated lower slope of the hill is situated the Roman Catholic mission, as also a very handsome stone house, the only one in the Niger territory, and the property of the Church Missionary Society. It was, when we were there, the residence of a native priest, the Rev. Archdeacon Johnson. Here I had the great good fortune to renew my acquaintance with Bishop Crowther, the native bishop of the Niger, whose name is intimately and honourably associated with every expedition which has visited the Niger since and including the one of 1841.

Shortly after daybreak on the 14th of August, 1889, we left our moorings at Lokoja and proceeded to steam up the Benue. We were accommodated on board the s.s. *Boussa*, a very commodious stern-wheel steamer of 400 tons, belonging to the Niger Company, and built expressly for the river. When loaded she drew five feet, being flat bottomed. The lower deck, which was about a foot and a half above the level of the water, gave accommodation to the Krubos, a guard of Niger constabulary, and the crew generally. The upper deck, which was supported on strong iron pillars, carried a very commodious dining saloon, capable of seating six or eight, several sleeping cabins, cook-houses, and offices. Above the upper deck was a substantial wooden awning, fastened and riveted to the deck with iron stanchions. In front of the dining saloon was a wheelhouse and charthouse, below which on the main deck was the boiler; two large funnels came through the upper deck, and were carried on through the awning, between the charthouse and dining-saloon. The heat from the boiler and funnels came in very useful for drying our specimens of birds, but was rather trying otherwise; the vibration of the engines also made writing a matter of some difficulty. In all other respects we were most comfortably housed, or rather shipped. In addition to my friend and private secretary, Captain Mockler Ferryman, we had on board Mr. Wallace, Agent-General of the Niger Company, whose intimate knowledge of the Niger territories was very useful to us; Mr. Charles McIntosh, brother to Mr. David McIntosh whom I have already mentioned, and who was at the time Agent-General for the Benue river; and a Mr. Dangerfield, who acted in the capacity of pilot, assisted by the other two gentlemen I have named.

As an instance of how excellent was the pilotage, I may mention that during the whole journey from Lokoja to Garua, a distance of some 600 miles, we were only aground on a single occasion, and that for only a few hours; on the return journey we did not touch ground once. Our ship, with her two large funnels placed side by side, and her upper deck and awning, presented a very imposing appearance as we steamed majestically up the river. The two large funnels sticking through the top of the awning inspired great respect in the Upper Benue, where so large a ship had never before been seen; the natives

were under the impression that these imposing chimneys could be lowered from their vertical position at our own sweet will, and fired off with destructive effect.

At Mozum we landed. It is the first village arrived at of any importance, and is prettily situated on the south bank. The chief, who is an Igara, on hearing that the Queen's messenger was on board, came down in state, surrounded by his head men and people. I had a long conversation with him, and he struck me as being a very sensible and intelligent man. At one time he was not so, for on more than one occasion he stopped and plundered the company's trading canoes; but having had an encounter with their constabulary he became chastened by affliction, and is now a great supporter of trade and the company. He told me that even now his people were in the bush picking rubber for the white man, which they would gladly exchange for Manchester cloth, and salt, &c. His people are mostly Bassas, though some few are Mahommedans from Nupe, the chief himself is an Igara from Ida on the Niger.

Baikie says in his travels, "The Bassa people have very dark skins and strongly marked features, and are more typically negro than the inhabitants of Igbira; they had formerly, and still (1854) retain a rather bad character as being turbulent, wild, and dangerous to travellers." As I have said, their turbulence has since been modified and tamed down, and they struck me as being a most cheerful and industrious people.

I walked through the native village, which was clean and well kept. The men of the tribe were armed principally with bows and arrows, and wishing to test their skill I placed my handkerchief on the stump of a small tree, about 60 paces off, and said that I would give a piece of cloth to the archer who could hit the mark. After considerable discussion and pushing forward of unwilling candidates, a young man, who seemed in popular favour to be the William Tell of the village, stepped to the front, and holding his bow horizontally sent a poisoned arrow whizzing into the centre of the mark. The enthusiasm amongst the young men and maidens at this successful display of bowmanship was unbounded; and from the bright glances cast at him by several pairs of soft brown eyes, I should opine that he had rather a "good time" subsequently, the more so as he became the possessor of a bale of cloth, the result of his prowess.

The country opposite Mozum is well wooded, and at one time was thickly peopled; Lander, Baikie, and Hutchinson speak of many villages. Nothing now remains but heaps of ruins blackened by smoke, and of these every vestige is disappearing under the luxuriant wealth of vegetation. This, too, was at one time the great cotton market of this part of the Niger basin; it is now an almost uninhabited waste. This desolation is the handiwork of the Mahommedans raiding in quest of

slaves. They have attempted to cross the river at this point, and carry their raids into the Bassa country; but the people, supported by the Niger Company and the river, have effectually held them in check. At Bohu on the south bank, and at Yamaha on the north, stoppages were made, and interviews held with the natives chiefs.

Bohu is prettily situated, but is a dirty village, inhabited mostly by Bassas. Here we encountered our first tornado, but it was only a baby one, and beyond blowing a gale with thunder and lightning accompaniment for about three minutes, did no particular harm.

We anchored for the night in midstream; the thermometer was 78°, and the night deliciously cool and pleasant. Starting the next morning at daybreak, we passed the villages of Amaran and Amagede; the former is very prettily situated. On the return journey I landed here and had a palavar with the chief; he seemed an intelligent man, and recognised the treaty obligations he held with the Niger Company. He was, however, somewhat nervous of his warlike *vis-à-vis* the Emir of Nassarawa, who during the dry season, when the river did not present such a formidable obstacle, was in the habit of raiding for slaves on to his side of the river.

At 4 p.m. on the 5th, we arrived at Loko. Here the Niger Company have a large trading station, under the management of a native agent; it is the port of the Nassarawa district. The Emir was fortunately at home at the time of our arrival at the village; I accordingly sent him a message informing him of my arrival, and that I had come as the messenger of the Queen of England, to confer with the chiefs and Emirs of the Niger and Benue, and requested that he would come and visit me.

Accordingly, at about 5 p.m., a very considerable commotion on the river bank announced the arrival of the Emir. This was my first meeting with one of the much-talked-of Fulbe Emirs (or provincial governors) of the Western Soudan, and I am bound to say in personal appearance he quite came up to my expectations. He appeared on the bank surrounded by a mounted retinue, he himself being mounted on a small country-bred horse, some 14·2 or 14·3 hands, which was cruelly bitted in the usual native fashion; a peaked saddle of Haussa leatherwork, the usual collection of pieces of leather, string, bits of chain, and charms consisting of verses from the Koran in little leather cases, which collection usually does duty as the bridle of an Arab horseman, and a gay saddle cloth, completed the trappings of his little steed. The Emir himself was wearing a large white turban with a scarlet peak; round the front of the turban was wound a piece of leather from which hung several charms similar to those which ornamented, and at the same time protected, his horse from evil spirits and other alarming possibilities; from one side of the turban hung a piece of black muslin, which was brought round and in front of the face similar

to the muslin yashmak worn by Turkish ladies. He was dressed in a voluminous "tobe" handsomely embroidered with green silk; very baggy trousers and embroidered scarlet shoes completed his costume.

Our ship lay as close to the bank as her draught would allow of, and was connected therewith by a narrow plank. The Emir negotiated the bank with some skill, and then, to my amusement, prepared to ride his horse along the plank; this somewhat novel way of coming on board was not however a success, and would have resulted inevitably in both the Emir and his steed falling into the river, so I sent him a message to say that I should be pleased to see him without his horse; he accordingly dismounted, and, followed by his somewhat dirty retinue, came on board.

The interview was a satisfactory one, and everything passed off harmoniously; the Emir was accompanied by the Endeji, or prime minister, a class of official who, in all my subsequent interviews with Mahomedan potentates of the Niger and Benue, gave more trouble than the potentates themselves.

As the Emir was leaving, the Endeji whispered to my interpreter that his master would like to see me on a matter of importance, but privately; I said I should be glad to see him that evening at nine. Accordingly, at the hour named, two figures were seen approaching through the darkness, which soon resolved themselves into the Emir disguised as a common Arab, but with rather a rakish-looking hat about the size and shape of a hip bath, and the Endeji similarly attired. They were shown with much secrecy into the little deck cabin where I usually held my palavers. There were present Captain Ferryman, my Haussa interpreter, the Emir, and his prime minister. After the usual salutations, the Emir commenced a speech, which had evidently been prepared by the prime minister; he said that he and his people were not tillers of the soil, they did not dig the ground, neither did they barter ivory or palm oil like the merchants from Kano and the north, and like the white men, subjects of the great white queen—no, they were fighting people; they fought the Pagans and made slaves of them. He had to send a tribute of 200 slaves to his master, the Sultan of Sokoto, and had great difficulty in getting them. Now, as I was all powerful, could I not, by the authority of my queen, make the white traders sell him rifles and cartridges, so that he might raid the tribes on the other side of the river and thus get what he wanted. Of course these rifles and cartridges would only be used against the Pagans, and not against the white men.

I pointed out that as he and his men were such warriors, surely they had their swords and bows and arrows, to fight against the Kaffirs, who were only armed with bows and arrows. I said also that the Queen, my mistress, ruled over not only her white subjects but many millions of people of the same religion and colour as himself, and she had found it sometimes very inconvenient to give them rifles and cartridges, which

had been used against her own soldiers. Besides, as he knew, the Queen and people of England hated slavery and the raiding of slaves, and therefore on no account could arms or ammunition be sold or given to him. He said, "Is this truly so?" I said, "It is so." The Emir, but more especially his prime minister, seemed very dejected at my words. I told them on parting that it would in every way be better for them if, instead of raiding their Pagan neighbours, they occupied themselves in tilling the soil. I am afraid, however, that my words fell on very stony ground.

Loko was a place of very considerable importance, but the glory has somewhat departed, as the Hausa traders now bring their caravans of ivory, &c., from the south, through Bakundi and places further east. The place is clean and well kept, being a collection of family enclosures, a certain number of huts being encircled by a sort of fencing about seven feet high, made of matting. It is the principal starting place in the Benue for messengers to Sokoto, and contains upwards of 4000 inhabitants, and is the port of Nassarawa.

At daybreak next morning we left Loko, and towards evening got into the Mitshi country.

This tribe have an exceedingly bad reputation, being savage and treacherous; they have no paramount chief or head, being split up into numberless families, they are thus exceedingly difficult to deal with, as a treaty made with a man representing himself to be a chief is simply laughed at by the rest; they have kept the Mahomedans in check, and occupy both banks of the river. At one time a considerable trade was done with them, and they had a wholesome dread of the white man, thinking that he had descended from the skies and was invulnerable. On a certain occasion, in the year 1885, a slight dispute arose with an agent of one of the trading companies whose stores had been robbed by some of the Mitshis. In the heat of the argument one of the young men of the tribe slipped a poisoned arrow from his bow, it is generally supposed in order to test the so-called invulnerability of the white man; the arrow just grazed the neck of a white clerk named Hoyland, scarcely breaking the skin. As the demeanour of the Mitshis was exceedingly threatening, the agent, named Griffiths, and his clerk retreated to the river, only a few hundred yards away, but before they reached it the unfortunate clerk had succumbed to the poison in the wound. The Mitshis finding that, so far as invulnerability is concerned, the white man very much resembled themselves, rose generally, and burnt the various factories and massacred as many white men as they could find. The agent Griffiths was treacherously murdered in December of the same year, and his skull is still used as a fetish by the Mitshis. Retribution was dealt out to them by the Niger Company in 1886, and several of their villages were destroyed.

The Mitshi country is a very fine one and well wooded, it is traversed by the river Katsena Allah, and there are silver and galena mines on

the right bank of the Katsena, which were being worked at the time when the disturbance took place. At the time of my visit to the Benue, all communication between the Niger Company and the Benue had ceased, and we steamed through without stopping. We passed several villages. The people turned out in considerable numbers; they seemed to be physically a fine race. The men leant on their spears and gazed at our big steamer without any symptoms of fear, while the women and children peeped out of the doors of their huts. Their villages were of the usual family enclosure order—a number of little huts, mud walls and thatched roofs, surrounded by a 7-foot fence of matting.

On Wednesday the 7th of August, we passed the mouth of the Katsena Allah; no mention is made of this river, or of the Donga and Bakundi, in Baikie's account of his exploration of the Benue to which I have alluded. The country is now more open, and freer from forest. Patches of green park-like looking grass appear; this grass, however, on closer acquaintance, is found to be some seven feet high, it dies down in the dry season, when the country swarms with game, the deer roaming about in large herds. At the time of our visit, the river having overflowed its banks, the deer and other wild animals had retreated into the thick jungle; we occasionally caught a glimpse of them, and in the Bakundi river shot a fine water buck, also saw an elephant swim the river in front of us, but could not get a shot.

At 9 p.m. on the following day we arrived at Ibi; this is a large station of the Niger Company, and their headquarters in the Benue; the people here belong to the Djuku tribe, and seem most intelligent, peaceful, and good tempered. Their king came on the following day to pay his respects; he declared himself to be perfectly happy and contented under the rule of the white man, and indeed nothing could be more friendly or good-natured than the behaviour of his people. The king was dressed in voluminous robes and a white turban; though he and his people are Pagans, they are independent of the Emir of Muri, who, however, surrounds them on all sides.

That afternoon, by special request, a number of Djuku warriors and Djuku belles paraded in their best clothes, the warriors armed to the teeth, each man carrying a bundle of spears, their poisoned barbs being protected, in some instances, by a sort of cylindrical cap made of deer-skin; the women were attired in bright-coloured cloths, usually two in number, one being brought round the body under the arms, and the other, which was generally of a brighter colour, thrown over the shoulders. Captain Ferryman produced his camera, and several groups were taken which promised to turn out very well—they were, however, all spoilt. The ladies of the tribe, on being told that we were taking sun pictures of them, were immensely interested, and grouped themselves with great readiness. I wandered about with a small hand camera and took furtive shots, some of which have come out fairly well.

Experience taught me that the removal of the cap from the lens when photographing was invariably followed by the hurried removal of the subject about to be photographed, who, apparently thought that the removal of the cap would be followed by an explosion or the letting loose of the fetish which the box undoubtedly contained. I consequently used to come into action with the camera ready loaded, the cap in my pocket, and with the instantaneous machinery prepared; I would then gaze into the sky and down into the camera, when I saw a nice picture reflected in the little detector, I would press the pneumatic ball, a slight click, and all was over. The Ibi photographs were the only ones in the Benue where the subjects had the least idea that they were "being took."

The next morning, August 11th, we left Ibi, thermometer, at 9 a.m., 75°, very cool and pleasant. We steamed the whole of that day without stopping; having covered about 50 miles of ground, we anchored at sunset in mid-stream, the river being some two miles broad. Soon after we had anchored the moon rose grandly over a low dark line of forest-covered hill, and threw her silver reflection on the magnificent expanse of water—a truly lovely sight. The whole of the day we had seen very few villages. Shortly after leaving Ibi, we passed the mouth of the Donga river, which we left for the return journey; also near the mouth the town of Zhibu, where Baikie and his companions were very rudely treated by the Emir. This town has always kept up a reputation for turbulence and general refractoriness, and has twice been punished by the Niger Company. Nominally it is under the Emir of Muri, who, however, seems unable to keep the place in order, and has to rely mainly on the Company to punish his turbulent subjects. Matters were very peaceful when we passed.

In the early morning of the 12th August, we up anchor and got under weigh; saw a herd of antelope, but they were too far off to get a shot. The scenery became still more open, though villages were few. At mid-day we passed the entrance of the Bakundi river; at 6 p.m. we anchored at a small village called Mainaraiwa. This is a "wooding station," where depots of wood are kept for the use of the Company's steamers.

The people here seemed to be somewhat wild and savage. We received a visit from the Emir of Muri's executioner, who happened to be in the neighbourhood. He explained the process, which consisted in first clubbing the victim on the head, and then cutting it off with a sword. He seemed to take a pride in his profession, and was withal a most cheerful executioner. In the morning, Captain Ferryman shot some white egret, with beautiful back feathers, and I bagged a fine spur-winged goose—the spur on the wing being as large as a tiger's claw.

At 1 p.m. on the 14th August, we reached Lau. We were still in the

jurisdiction of the Emir of Muri, and the people were by way of being Mahommedans, though their Mahommedanism was very much on the surface. Here we saw a good number of women, who were Fulbe, or rather had Fulbe blood in their veins; they dressed their hair in a peculiar way, viz. over a pad in shape resembling a policeman's helmet, though not quite so high. The hair, which was about a foot long, was brought up and dressed over the pad; down the centre of the helmet were stuck a variety of ornaments; the two side locks were plaited and brought down on either side of the face.

There is a considerable trade done here in tin, which is collected by the natives in the streams which come down from the hills; they melt it down and bring it for barter in the shape of wire about half the thickness of one's little finger. The tin is of very good quality. Gum copal, gutta-percha, rubber, and gum arabic are the other articles of trade.

The scenery, after leaving Lau and before arriving at Djen, is very fine. Ranges of hills appear on both sides, the Muri range on the north, some six or seven miles from the river, rising to a height of several thousand feet, and the Fumbina to the south, some 15 miles from the river.

The country is very thickly populated and completely unexplored on both sides of the river. Great future possibilities in the way of plantation exist here, for the climate seems suitable for tea, coffee, and rice. We passed several villages, where the people fled *en masse* and hid in the surrounding fields of millet. We could see warriors armed with bow and spear standing as outposts at the corner of the fields, whilst hidden in the corn were their wives and children. We shouted salutations to them, and they would then in some instances return to the bank and run along shouting and laughing and clapping their hands.

We stopped at Djen to purchase live stock. Here the people were very friendly, though their costume was somewhat startling, the ladies of the tribe being the principal offenders in this respect, the majority of them being absolutely without clothes of any kind. Barth, in his travels, says:—"I have observed that many of these simple tribes deem some sort of covering, however scanty it might be, more essential for the men than the women."

The people of Djen closely resemble those of Lau. They are Battawa, speaking the Djuku dialect. The members of Baikie's expedition in 1854 were the first white men the people of Djen had seen, and it was with considerable difficulty that they were able to get away. We passed other villages, amongst them Dulti, where Baikie's expedition turned back. The people looked wild and savage, and for the most part fled into the bush at the sight of our two black funnels pouring out smoke.

On the following day, August 16th, we started at daybreak, and at 10 a.m. arrived at Numan, a prettily situated village on the south bank,

surrounded for some distance with cultivation, principally millet, Indian corn, and cassava. The king or chief of this place is a very old man, exceedingly friendly with the white men and most anxious to trade. I went on shore to see him, and we held a palaver under some trees on the river bank. His people had, however, all fled on the approach of our steamer, and the king and his court—some half-dozen naked and very savage-looking men—alone remained. I told the chief to send messengers to collect his people and tell them to come in and not be afraid. As the palaver continued, groups of men, women, and children kept coming in, and I must say they were a savage-looking crew, have the reputation of being good fighters and also good agriculturists. The men were all armed with bows and spears; indeed, in the whole of this part of the Benue it is very rare to see a man or a boy without a bow or spear. We had a very friendly interview, and parted with many protestations of goodwill. These people were owners of several herds of cattle and some really very good-looking ponies. Getting under way, we arrived at noon at a place called Bula. This consists of a collection of some half-dozen villages, and the people bore rather a bad reputation for plundering and savage propensities generally, and are at war with most of their neighbours, including our friends at Numan, who call them "bad people." One of their villages had been burnt down in 1888 by the Niger Company as a punishment for having attacked and plundered a surf boat coming down the river. Ours was the first steamer that had visited this part since that episode, and we were consequently doubtful of our reception. On our approach the villages were deserted; not a sign of a living being was to be seen, except, far away in the fields of millet, the occasional gleam of a spear denoted where the people were in hiding; we, however, anchored close in to one of the villages, and sent one of our interpreters on shore, who was a Hausa, but could speak Djuko. We heard him, wandering about through the deserted streets of the village, shouting out messages of peace in the Djuko tongue; at last, from the inmost recesses of one of the inclosures an old man appeared, and, after some demur and palaver in the millet fields, some more men came, and eventually an evil-looking individual, in a very tattered cotton night-shirt, who they said was the chief. We instantly began to barter, paying rather fancy prices for wood and live stock, and in twenty minutes were surrounded by half the village, all talking at once and in the best of tempers. I took a walk through the village, which was of very considerable extent, and consisted of the usual collection of huts, each enclosure fenced in by matting. We stayed here two hours, until confidence was thoroughly restored, and parted very good friends, and the chief presented me with his own spear, which is looked upon as a great honour, so our interpreter informed us. At 7.30 the same night we anchored off Gire. The people here are Battas, and their language is spoken on the north

bank, from Bassama to the east of the Taburi marsh. It is also spoken along the Faro river beyond Mount Alantika, and also the whole region north, from these rivers as far as the southern boundaries of Bornu, and is different from the language spoken by the people of Bula, with whom the Battawa have no communication, and also look upon as "bad people." It is in their language that the river has received its name, Be signifying "water," and nuwe "mother," hence Mother of Waters. Their prince, Kokomi, was, previous to their conquest by the Fulbe, the most powerful chief in the country.

As it was dark, we sent messengers on shore to ask if some of the head people would come off and see the Messenger of the Great Queen. In about an hour's time the chief of the village and some of his retinue came off and had a palaver. Considering that they had in all probability never seen a white man, I was rather surprised at their temerity. The interview was very interesting, and the Battas, as represented by their chief, seem to be a very pleasing people. They informed me that from that day forth the life of a white man should be sacred in all their territories.

We were now on the borders of the great Mahommedan dependency of Sokato, Adamawa, "a Mahommedan kingdom engrafted upon a mixed stock of Pagan tribes—the conquest of the valorous and fanatic Fulbe chieftain, Adama, over the great Pagan kingdom of Fumbina."

On Saturday August 17th, away at daybreak, and at 9 a.m. anchored close along shore on the southern bank. The country hereabouts was very pretty, being hilly, the hills where we were anchored coming right down to the river bank.

On the opposite side of the river there was a fine range of mountains stretching away to the north. Captain Ferryman and myself spent the morning in exploring the country on the south bank and looking for ornithological specimens, of which we got several. We had a very pleasant climb to the top of the hill, from which we got a most lovely view of the town of Yola, which lay at our feet a mile and a half from the edge of a large lake. The plateau on which we were standing was some 600 feet above the river, and completely commanded the town, which was some three miles distant. The town itself is of considerable size, and consists of a collection of brown thatched huts, each enclosure being planted with trees; so from where we stood Yola looked like a collection of several thousand haystacks, in different shades of brown, some large, some small, embosomed in trees, which had a very pretty effect. The lake of which I have spoken is merely an overflow of the Benue; in the dry season it dwindles down to a fourth its present size; as we saw it, it must have covered several hundred acres, and was very nearly at its highest level. To the south-east we saw a fine range of mountains, dark-blue in the distance; to the eastward wound the river Benue, still a noble stream nearly a mile wide.

The plateau on which we were standing, like the remainder of the country round Yola, was cultivated with millet, *Pennisetum typhoideum*, and Indian corn, sweet potatoes, yams, manioc. Pretty little farms were dotted here and there, their brown thatched roofs contrasting very bonnily with the fresh green of the surrounding cultivation. The sun was hot, but a delightful breeze swept over the country and made "waves of shadow" over the fields of maize and millet. The people came out of the farms, and were most polite, though our interchange of civilities was carried on by means of signs; they were Mahommedans, and consequently clothed, their religion also accounted for their civility.

The Emir of Yola was at the time of our visit suffering from a fit of very bad temper, and had declared his intention of never receiving a white man again; and though I sent him a copy of my Commission from Her Majesty (translated into the Hausa language and written in the Arab character), to show that I was in reality the messenger of the Queen of England, together with friendly messages; he was obdurate, and refused to see me unless I could produce a letter from the Sultan of Sokoto, his master. As I had not such a commodity, and it would take several months to get one, I sent him further polite messages, and returned in my steam launch to our floating home, the *Boussa*.

I mentioned that I would be returning in ten days or so, and that I hoped he would then be able to see me. Fits of temper seem to be hereditary in the Emirs of Yola. The Emir Mohammed Lawal, son of the Sultan Adama and brother of the present Emir, ordered the great traveller Barth, the first European who had ever visited the country, out of his territories, after he had journeyed from Kukawa to see him. The command ordering him to leave was brought to him by messengers, and was couched in the following words, which are Dr. Barth's own:—"The Sultan [all these Emirs or provincial governors bear the title of Sultan] had ordered them to beg me to accept his most respectful regards, and to inform me that he was nothing but a slave of the Sultan of Sokoto, and that I was a far greater man than himself. As such a man had never before come to his country he was afraid of his liege lord, and begged me to retrace my steps from whence I had come; but if in course of time I should return with a letter from Sokoto, he would receive me with open arms."

This occurred on the 22nd June, 1851; the message was almost identical with the one sent to me by the present Emir.

Before leaving this subject I may say that, on our return journey, I sent Captain Ferryman, together with my Hausa interpreter, into Yola to see whether the Emir was in a better frame of mind. Captain Ferryman succeeded in seeing the Emir's eldest son, called the Yerima, and his brother, and was well received by them; they said that now they knew who we were, the Emir would certainly see us next day at 10 a.m. Though it had been my intention to proceed down the river

with all possible despatch, as I had yet a great deal to do, I sent a message to say that I would come to the edge of the lake next morning by 10 a.m., and would wait one hour. This I accordingly did; but as there were no signs of any body appearing, I returned to the *Boussa* and steamed down the river. Captain Ferryman reported that the town of Yola was of considerable extent, the house of the Yerima being upwards of a mile from the entrance to the town. The town consisted of enclosures of half a dozen huts, sometimes more, surrounded in some cases by a mud wall about 10 feet high, the whole enclosing a good sized compound, in which corn, millet, and sweet potatoes were growing. The huts of the poorer inhabitants have the usual mat fencing. The whole town was well shaded with trees, and the roads through the town, though narrow, are clean, as the soil for the most part is sandy.

The house of the Yerima was, of course, of the better kind, having an entrance-hut or hall called the "Segifa." From here Captain Ferryman was conducted through a small yard, then through another hut, then a second yard, and then into the reception hut, which was strewn with sand and fine pebbles; this is used by the Fulbe for palavers.

We left Yola on our way up the river at daybreak, on the 19th August, through varying scenery, the hills coming at first close to the water's edge; to the south was the isolated peak of Bagele, one of the last strongholds of the Pagan Batta tribes to the east of Yola. In 1853, Mohammed Lawal sallied forth with an immense host, and after a siege of almost two months, succeeded in conquering the mountaineers and reducing them to slavery. Nearer to Yola the detached cone of Takabello formed a conspicuous object, rising to a height of 1000 feet, while in the far distance the mountain mass of Alantika, the home of several independent Pagan chiefs, towered 8000 feet above the plain.

At 3 p.m. we reached the junction of the Faro and Benue, the former a fine sheet of water, broader but shallower, and with a swifter current than the "Mother of Waters." It was here that, on the 18th June, 1851, the great traveller Barth first struck the Benue, which "far exceeded his most lively expectations." He says, "The principal river here flowed from east to west in a broad and majestic course through an open country, from which only here and there detached mountains started forth. The banks on our side, i. e. the north, rose to 25 feet, and in some places to 30 feet, while just opposite, behind a pointed headland of sand, the Faro rushed forth, coming in a fine sweep from the south-east, where it disappeared in the plain, but was traced by me in thought upwards to the steep eastern foot of the Alantika. The river below the junction, keeping the direction of the principal branch, but making a slight bend to the north, ran along the northern foot of Mount Bagele, and was there lost to the eye, but was followed in thought through the mountainous region of the Bassama to Hamarna, and thence along the industrious country of Kororofa till it joined the great western

river, Kwarra or Niger, and conjointly with it ran towards the great ocean."

After passing Taepe, a small village on the north bank (Tepe, a Fulbe word meaning junction), the Benue narrowed considerably, and in places the channel is not more than 300 yards wide, but flowing with a rapid current through dense jungle, which came to the water's edge. The depth of the channel here was 16 fathoms. At the back of the jungle the country appeared to be open, with isolated hills wooded to their summits, and small ranges, some two miles in length, lying back from the river. On the following day, at about 11 a.m., we arrived at Garua in the Ribago province. The Emir of Ribago is under Yola. He happened to be in town on the day of my arrival; his residence is some distance in the direction of a fine range of mountains which lie to the north-east of the town. I sent a message to say that the envoy of the Queen of England would be glad to see him on board; to this came back a reply to the effect that the Emir was too ill to come himself, but that he would be very glad to receive myself or my vizier. As I was not certain of the truth of the first part of the message, and not wishing to lower the status of an English envoy in the eyes of the Mahomedans, who would only be too quick to notice that I had been to see the Emir, and not that the Emir had come to see me, I directed Captain Ferryman to take friendly messages and compliments, also a present from Her Majesty to the Emir. Captain Ferryman reported that he was met at the landing stage by several attendants, who brought with them a very well-shaped country-bred horse, and preceded by four horsemen and accompanied by half a dozen footmen, all armed to the teeth, he rode up to the Emir's house. The Emir was an old man enveloped in robes, with the usual black veil or lingham across the lower part of his face. He was very friendly, but impressed upon Captain Ferryman that he was under the Emir of Yola and the Sultan of Sokoto, and was personally very desirous of being friendly with the white men. He expressed himself very gratified with the presents from Her Majesty, and made a return present of live stock, which we subsequently ate.

On leaving the King's house, Captain Ferryman met and had some conversation with the representative of Bornu at the Court of Garua. Most of the provincial governors, Muri, Yola, Bautshi, Zaria, &c., have representatives from Bornu and the Houssa kingdom staying with them.

Garua is, as I have said, the chief town of a province which is a dependency of Yola, of which indeed it may be said to form a part. The town much resembles Yola, only it is about one-third the size. The people are Fulbe or their descendents, and seemed remarkably pleasant and friendly, and I saw some very good-looking women amongst them, with most cheery and expressive features. The country round is open and under cultivation. The principal feature, however, is the fine range of mountains which I have mentioned, and which is distant about

15 miles E.N.E. of the town. They run north and south, the southernmost spurs coming right down to the north bank of the river. They are, I should say, between 2000 and 3000 feet high. I went out with my gun and shot some large kinds of stork, also some crown birds or Balearic cranes, which latter are extremely common in the Benue and Upper Niger.

The range of mountains of which I have spoken are peopled by a wild and warlike race of Pagans, who have defied all attempts of the Fulbe to subdue them, indeed have almost always come off best in their encounters with the Mahommedans, and have raided the ivory caravans travelling to Kano and Kuka right up to the walls of Gurua. In 1887 this tribe, who are called Tangalia, a section of the Battawa, attacked a caravan of ivory merchants on the outskirts of Garua, killing thirty-five men, and escaping with their booty. An encounter had taken place about a fortnight before we arrived, in which the Mahommedans had to retire with a loss of eleven killed. The Tangalia are under a chief named Shabana, who has a lieutenant called Fere, and their word is law. The Tangalia wear no clothes, the men wear a string of cowries, from which depends an apron of skins, the women wear nothing but a string round their waists; those who wish to excel their sisters in the matter of frocks, beat out the bark of the Kuka tree till it resembles a horse's mane, and wear it as an apron.

In 1885 the Emir of Yola sent an expedition against them, but lost forty men in the attack and beat a hasty retreat.

The Tangalia number upwards of 1000 fighting men; they practise polygamy when they can afford it, and their only pursuits are growing corn and raiding the Fulbe.

We had now reached the farthestmost station of the Royal Niger Company. The river was still a fine stream, at this season of the year some six or seven hundred yards wide, and six or seven fathoms deep in the channel. Half-a-mile above the town on the north side it had overflowed its banks and formed a good-sized lake, now covered with waterfowl; to the south and south-east the country seemed flat. On making inquiries amongst the Niger Company's officials and the people of the place, I ascertained that the main river for some distance flowed from the east, but shortly after being joined by a river called the Kebbi, which appeared to come from the north-east, the Benue proper took a southerly course and had its source in the Bub'n Jidda mountains. The company at one time carried on trading operations in the Bub'n Jidda country, and had navigated the river as far as the mountains of that name, until it became little better than a mountain torrent. With regard to the Kebbi very little was known; it had never been navigated by a white man, but it was supposed to come from Lake Chad.

Barth, writing in 1853, says, "That this river, the Benue, is anywhere called the Chadda, I doubt very much, and I am surprised that

the members of the late expedition in the *Pleiad* (Baikie) do not say a word on this point. I think the name Chadda was a mere mistake of Lander, confirmed by Allen, owing to their fancying it an outlet of Lake Chad."

Though I was aware that the local rumour with regard to the Kebbi having its source in Lake Chad was nothing more than a rumour, I thought it would be interesting to explore this river; firstly, because it had never been visited by a white man, and secondly, to verify and reach, if possible, the southernmost point of the Tuburi marsh, laid down by Dr. Vogel, one of Barth's lieutenants, in 1854.

Barth, writing of this, says, "Dr. Vogel, accompanying a slave-raiding expedition undertaken by the Fulbe usurper, Abd-el-Rahman, in the rainy season of 1854, pushed on into the very country of the Tuburi, and laid down that most interesting point by astronomical observation, although the great lake which my friend thought to find there was apparently nothing but a widening of that stagnant water-course which forms the north-eastern branch of the Benue, namely, the Kebbi."

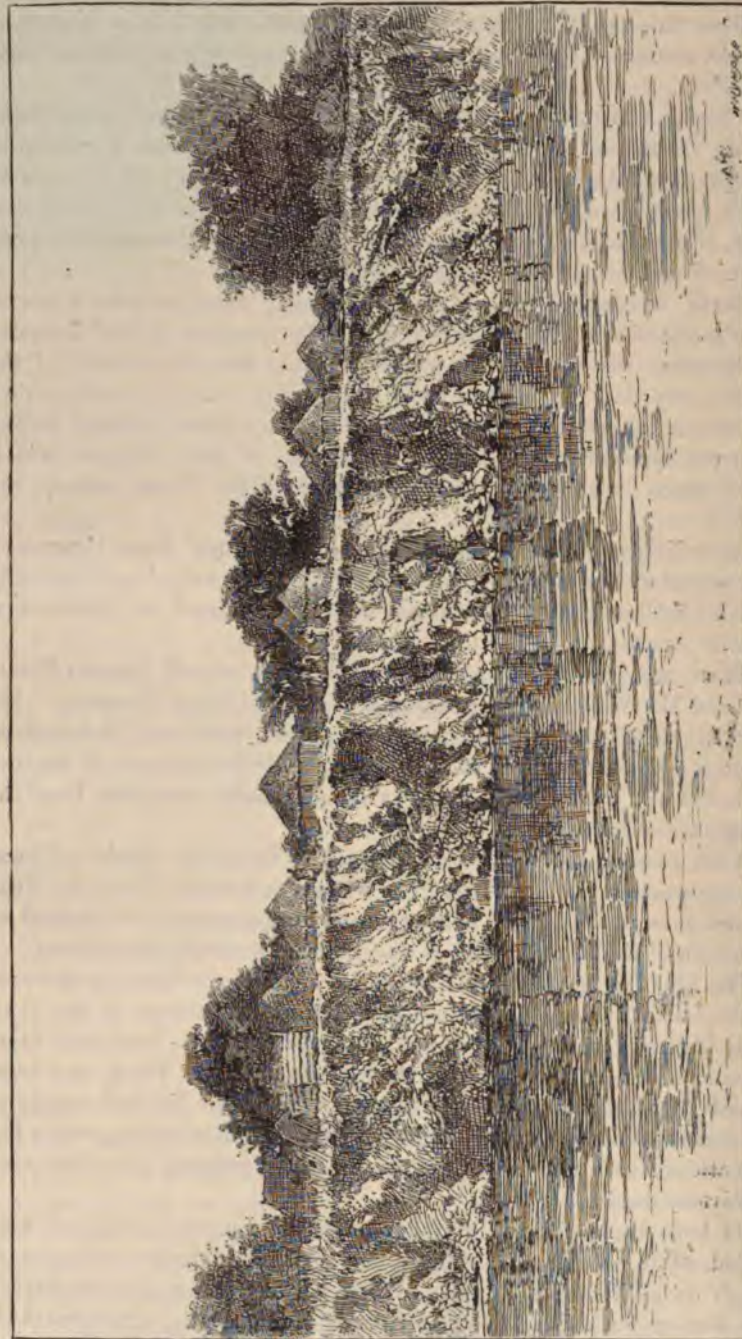
Accordingly, having obtained the use of the Royal Niger Company's stern-wheeler, *The Benue*, a little craft eminently suited and specially built for the navigation of shallow rivers, we started on Wednesday, the 21st August, at 11 a.m.

There were on board our little craft, beside myself, Captain Ferryman and Mr. Wallace, acting Agent of the Royal Niger Company. We had with us 25 natives as servants, engineers, crew, and interpreters, and took a plentiful supply of Manchester goods for purposes of trade—the safest and best means of receiving a friendly reception from the strange tribes we expected to meet.

After passing the mountain range of the Tangalia, which, as I have said, approaches closely to the river's bank, and which from our little steamer presented a grand and picturesque appearance, we arrived at the mouth of the Kebbi, which is distant some ten miles from Garua.

The Kebbi is here some 250 yards wide, while the Benue is upwards of 600. The average depth of the Kebbi at this season of the year, nearly high water, is from 10 to 12 feet. As our little craft only drew little more than a foot we had no fear of grounding. We at once commenced to make a survey of the river as well as the limited supply of instruments at our command would permit of, taking bearings with the prismatic compass, and plotting down the river, judging the distance of the various reaches by the eye.

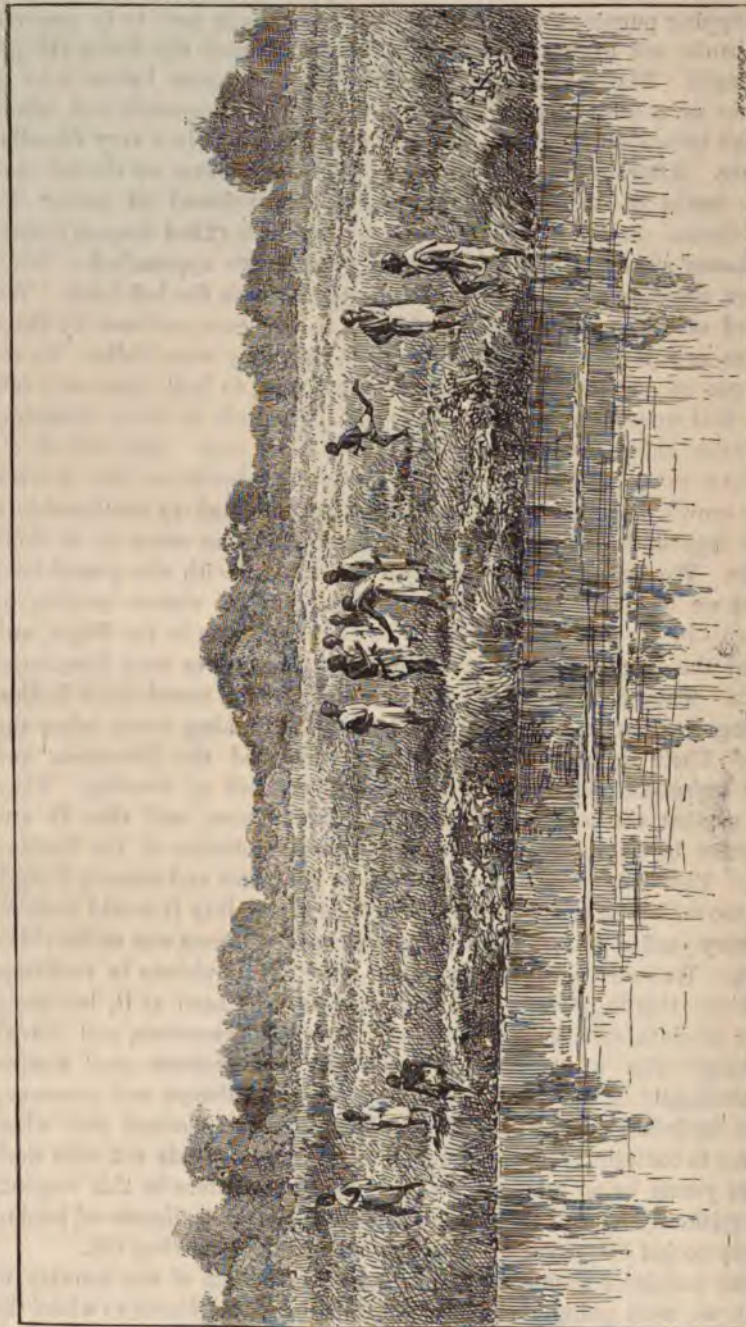
On both banks for the first five miles the country is flat and well wooded, with patches of bright green grass, and looks very gamey, though owing to the high grass we saw no deer. A noticeable feature some five or six miles from the river is Mount Katie, a rounded hill, some 800 feet high, well wooded to its summit. This hill, from its



DINGHI.

isolated position, served as an excellent point on which to take angles for mapping purposes. Patches of cultivation were now to be seen on both banks, and after two hours' steaming we passed the Fulbe village of Dinghi. The inhabitants, though they had never before seen a steamer or a white man, did not seem much disconcerted, and, when shouted to in their language, returned our salutations in a very friendly manner. After passing the villages of Be and Malum, on the left and right banks of the river respectively, we anchored at sunset in $1\frac{1}{2}$ fathoms. Starting next morning at daybreak (22nd August), after two hours' steaming against a 4-knot current, we approached a large village, standing about half-a-mile from the river on the left bank. We noticed several women and lads hiding in the corn, and saw by their clothes, or rather by their being clothed, that they were Fulbe. So we told one of our interpreters, who was a Fulbe, to hail them and tell them that we were white men and would like to talk to them. Running our little ship alongside, we made fast to a tree. The hidiers in the corn came out by twos and threes, and gradually we had quite a large crowd, and this notwithstanding that they had to wade across a small lagoon, the water of which in most instances came up to their waists. We very soon saw that we had to deal with the purest-bred Fulbe we had seen so far. The crowd consisted almost entirely of women—by far the best-looking we had as yet seen in the Niger, and indeed the best-looking I have seen in either east or west Equatorial Africa. They wore the usual piece of cloth wound round their bodies, leaving their arms and shoulders bare, and reaching down below the knee. Their features, in most cases, approached the European, and their expression most gentle and modest, yet full of vivacity. They told us that the name of their village was Pamu, and that it was governed by an Emir, who was under the jurisdiction of the Emir of Yola. The men were armed with spear and bow and arrows, though they are said to be an agricultural people, and certainly it would seem so, for every yard of ground in the neighbourhood of Pamu was under cultivation. We asked them if they would bring us provisions in exchange for cloth; this they readily did, and we soon were hard at it, bartering pieces of cloth, salt, &c., for live stock, weapons, ornaments, and indeed anything. The whole time nothing but the greatest good temper prevailed, and I was much struck by their gentleness and courtesy; albeit the ladies were very good at a bargain, and I noticed that when it came to bartering their ornaments, members of the fair sex who were not so young or so fair as their more fortunate sisters in this respect, surreptitiously handed their ornaments to the latter to dispose of, hoping thereby to get better value, and I am bound to confess they did.

The people of Pamu seemed to know very little of the country to which we were going, and could give us no information as to where the river came from.



PAMU.

We left Pamu at 10 a.m., after promising our fair traders most faithfully to look in on our return journey.

The river now ran due north and south, and we passed two little hamlets, Chow and Piske (both inhabited by Fulbe), the former at noon, and the latter at 1 p.m., after leaving which we steamed for the rest of the day without seeing a human being or habitation of any kind. Due west of Chow we saw, at a distance of 10 or 15 miles from the river, a fine range of hills, the highest peaks of which must have been 1000 feet high.

This deserted strip of country, which was evidently the barrier between the Mahomedan and Pagan tribes, was of an undulating character, with isolated hills, and well wooded. We saw numbers of birds—kingfishers, fish eagles, pelicans—and later in the afternoon disturbed some hippopotami, but as I have said, not a single human being or habitation. The river was still about 100 yards wide, but commenced to be dotted with grassy islands, and was in parts very shallow with a sandy bottom. At sunset we anchored in mid-stream. On the right, about a mile off, was the commencement of a range of grass-covered hills, from 1800 to 2000 feet high, while straight ahead and almost due north was a magnificent range of rocky peaks, with what appeared to be a chasm through which we conjectured the river might find its way. This rocky range was apparently some five miles distant. Some of the peaks were, I should say, quite 2000 feet high.

We passed a quiet night, disturbed only by the wallowings of an occasional hippo.

At daybreak we were under steam again, and were all alert, as the country seemed to be about to assume a completely different character, the undulating grassy plain dotted with small hills giving place to a more mountainous region. The river now narrowed again and made a sharp bend to the eastward, and, rather to my disappointment, approached the grassy range of mountains, leaving the higher range to the north. Half an hour after starting we arrived at the foot of the grassy slopes of the former; a pathway, which we could trace for a considerable distance, wound up the face of the mountain and disappeared over one of its grassy ridges. Patches of cultivation could be seen dotted here and there; the main valley stretched back some three or four miles, but we could see no signs of a village.

We were, however, not left long in doubt as to whether the country was inhabited or not, nor as to the character of the inhabitants, for down the winding path, which was distant some 600 yards from where we were, came a line of warriors, some 200 in number; the majority of them were quite naked, though some few had a small cloth round their waists. They were all armed, mostly with spears, the almost invariable number being three. Leaving the pathway, they advanced in excellent order across the boulder-covered grassy piece of ground which lay

between the river and the mountain side. We accordingly moved into mid-stream, which was only some 15 yards from the bank, and dropped anchor in about 4 feet of water. Our friends advanced straight at us, not a word being spoken, but an excellent line being maintained, when



THE KEBBI BELOW CHOW.

suddenly they all took cover behind boulders and tufts of grass, nothing being visible but the gleaming points of their spears. It was a source of some gratification to us that the points were gleaming, for it showed that at any rate they were not poisoned.

There was now a pause. Then our Fulbe interpreter, under my directions opened fire in a dialect of the Battawa, with satisfactory results, for they appeared to understand him. Their first question was as to whether "we were Mahommedans? because if so we could not pass, as they were the outposts of the Pagan tribes, and had orders not to allow Mahommedans to pass." We assured them that we were not Mahommedans. They then told us, in answer to our queries, that the name of their village was Katsho, and that it lay back from the river amongst the hills; they said that if we went on we would come to more villages. After a great deal of persuasion two of their number consented to come on board. So we sent a six-oared gig, which we had towed up with us in case of accidents, to fetch them. They were fine, well-made men, but were trembling with fright at the sight of the steamer and white men, and prostrated themselves on the deck at our feet. These two men wore loin clothes of native manufacture; the great majority of the others were, as I have said, naked.

After getting as much information out of these men as we could, which information, on account of their terror and the difficulty in interpreting, was somewhat meagre, we proceeded on our way.

By this time large numbers of men and boys had assembled, and ran along the banks gesticulating and pointing at our little ship. They, men and boys alike, were all armed, mostly with spears; we saw very few bows and arrows.

The scenery now was very picturesque, to our right, i. e. the south of the river, some few yards from the water's edge, the mountains rose in some places quite abruptly. These mountains were for the most part covered with green wavy grass very pleasant to the eye. One or two streams trickled down the mountain side, forming now and again picturesque waterfalls. The river had suddenly broadened out to a lake, or more properly speaking, marsh, some three miles long by two wide. The range of grassy mountains I have mentioned ran along the southern shores of the lake and terminated with it. The country on the east and north shores of the lake, as far as the eye could see in the direction of the Tuburi marsh, was open and gently undulating, while from the western shores of the lake the beautiful range of mountains, with their needle-shaped peaks, stretched back apparently for many miles. In the north-east corner of the lake we saw a very large village some two miles distant, this we afterwards ascertained was Bifare. The channel of the river evidently followed the base of the southern hills. We accordingly steamed gaily along, followed on the shore by an ever increasing crowd, till we arrived at a large village prettily situated almost on the edge of the lake. The houses or huts were built in clusters, each cluster apparently belonging to a different family. The huts were very well constructed, having round walls some 6 feet high, with flat roofs formed by beams covered over with mud and thatch.

The walls of the huts were made of black and in some places red mud, and the workmanship of both walls and roof was excellent.

Several hamlets were prettily situated on the slopes of the hill, surrounded with patches of cultivation, and had the appearance of the country places of the richer inhabitants of the village.

A large crowd had now assembled, and regarded our movements with great curiosity. We asked to see the chief of the village, and after a good deal of palaver, a man appeared attired in a very tattered "tobe" or gown. He had something of the Fulbe in his countenance and was a tall fine man, though of rather forbidding appearance. He came on board, and we endeavoured to get what information we could out of him. He said the name of the big water we saw was Nabaret, but that it was only a fourth that size in the dry season. The name of his village was Kaku. The channel of the river ran along by the mountains. He knew of the Tuburi marsh, but had never been there; he did not think the river came from there, as it was distant many days' journey. He knew of no other big water, but would give us a guide to show us the way.

The people of the Nabarat district are possessed of cattle but no horses, they live principally on dhurra, which they cultivate largely, and on fish which abound in the lake. They also hunt the hippopotami, of which we saw a dozen in the lake, though doubtless there may be many more.

As the demeanour of the people was apparently friendly, we ran our

little steamer alongside, and were immediately surrounded by a crowd of warriors, who walked into the water and examined every part of the ship with great interest, surrounding her on every side. The women of the tribe now began to show themselves, usually a guarantee that no immediate hostilities are intended. They were not unpleasing in appearance and possessed of very good figures, most of them had nothing on except a piece of string round their waists. I noticed one young girl of about sixteen who had bracelets of tastefully arranged beads on her arms and legs, and was evidently a young lady of distinction; she was standing up to her knees in the water amongst the crowd of men, and regarding our ship with the greatest interest. I asked the interpreter to ascertain who she was; directly the question was put the men round seized her in the twinkling of an eye, and amidst much laughter, landed her on the deck dripping at my feet. The poor girl immediately sat down and began to weep; the chief, who turned out to be her brother-in-law, pacified her, and a small present of cloth soon made all right.

While we were making arrangements for a guide, the warriors began to be somewhat boisterous, and one of their number seized a flag belonging to the Niger Company, which was lying folded up on the side of the steamer, and placing it in his canoe, sat on it and paddled off with great celerity. The chief was, or pretended to be, very wroth, and shouted after the man, who, however, paid not the least attention, and we never saw that flag again.

After bidding farewell to the chief and his sister-in-law, and telling him that we were going to proceed up the river as far as we could, we slowly backed out into the stream. At the first turn of the paddles and rush of steam there was a general stampede on the part of the women, and several spears were poised and quivered in a most ominous manner, the result, perhaps, more of fear than of any hostile intention.

I think it not improbable, however, that had we remained longer, an attack would have been made on the boat, as the natives had evidently no knowledge of firearms, and seeing that we possessed no spears or weapons of any kind, would doubtless have attempted to capture our little steamer.

We took our guide on board and endeavoured to make for Bifare, already mentioned, which appeared to be a village of quite six thousand inhabitants, situate on the north-east shores of the lake, and distant some two miles from where we were. After proceeding about 100 yards we found that the water shoaled to about a foot, and even less, and though we made every effort to proceed, we were completely baffled; turning back, by direction of the guide, we went for an opening in the high dhurra, which grew in immense quantities about here, and found ourselves once more in the channel of the stream, which was, however, only some eight yards wide and $2\frac{1}{2}$ feet deep, flowing with a swift current.

After proceeding with great difficulty for almost a mile, with fields of dhurra growing to a height of eight feet on either side and completely shutting out the view, the navigation became so difficult that we had to turn back, having already smashed in the bow of our gig, bent our rudder into the shape of a bow, and more than once berthed our little ship amongst the dhurra stalks. The stream was so narrow that we could not turn, but had to float down backwards for a good half mile. The highest point reached was a mile and a half from the village of Kaku, and from what the people said, a good thirty miles from Dawa, in the Tuburi country, the furthest point reached by any European entering Africa from the north, viz. Dr. Vogel in 1854.

The stream at the point where we reluctantly turned back was not more than two feet deep, and from fifteen to twenty feet wide, and this at the period of high water. I should say that in the dry season (and this is corroborated by the natives themselves) that a man could step across it. It is more than probable, therefore, that had we been able to proceed another three miles or so, we should have arrived at its source.

Barth, writing of the Chad basin in January 1852, utters some prophetic words. He says: "Of course in a country politically rent into so many petty principalities, where every little community, as in ancient times in Latium and Greece, forms a separate little state in opposition to its neighbours, no considerable intercourse is possible, and the natural high roads with which nature has provided those countries, and the immense field therefore which is open in these regions to human industry and activity, must remain unproductive under such circumstances; but it will be turned to account as soon as the restless spirit of the European shall bring these countries within the sphere of his activity. This period must come; indeed I am persuaded that in less than fifty years European boats will keep up a regular annual intercourse between the great basin of the Chad and the Bight of Biafra."

Once more in the lake of Nabarat we repaired damages, and stood in close to the village of Kaku, where, taking a friendly farewell, we turned our steamer's head homewards. Previous to our leaving I had a few words with our guide, who, during all the time he had been with us, had never for a moment parted with his three spears. On paying him in cloth, which we did handsomely, he said it wasn't enough, because we had given the king five pieces of cloth, and he only got two. What had the king done? Nothing; whereas he had shown us the way. I said, "Oh, but he's a king, which makes a difference—wears a shirt." "A nice sort of a king! He's only chief of a family—not of mine. I'm just as good a man as he is, and done something for you, and he hasn't. I want more cloth." Though my friend certainly could have done with a good deal more, I pointed out that the cloth was mine, and if I chose to give the king five and him two, that was my business. It was only when we were some distance from his village that he jumped

into his canoe, which we were towing alongside, and paddled off, using, so far as I could judge, unparliamentary language. I mention this little incident to show the difficulties of dealing with some of these Pagan tribes, who are split up into families, none being paramount.

We now had the current with us, and went along at a great pace, some 10 to 11 knots an hour, and at 1 p.m. on the following day came alongside the s.s. *Boussa*. Though our little piece of exploration partook more of the nature of a picnic than anything else, I venture to think that we may have added one very small grain of geographical knowledge to the amount that has already been collected. It was a matter of great regret to me that we were unable to reach the Tuburi marsh, and thus join hands with European exploration from the north; but I venture to think that we established the fact that the Kebbi has no communication with the Chad basin, and that we had arrived within a few miles of the watershed that here divides the basin of the Niger and that of the Chad. I cannot, I think, close this paper on the "Mother of Waters" better than by re-echoing the words of Barth, written when he first saw the Benue on the 18th June, 1851.

"I had now with my own eyes clearly established the direction and nature of this mighty river, and to an unprejudiced mind there could no longer be any doubt that it joins the majestic watercourse explored by Lander, W. Allen, Laird, and Oldfield. Hence I cherished the well-founded conviction, that along this natural high road European influence and commerce will penetrate into the very heart of the continent and abolish slavery, or rather those infamous slave hunts and religious wars which destroy the natural germs of human happiness spontaneously developed in the simple life of the Pagans, and spread devastation and desolation all around."

After the paper,

Sir GEORGE T. GOLDIE:—I assure you I was quite unprepared to be called upon to make any remarks, as I came solely as an auditor; I hope therefore you will excuse my cutting short what I have to say. We have all listened with the greatest interest to the admirable paper of Major Macdonald. To myself, although the places are only too familiar to me, it seemed quite a new story to listen to him: he managed to impart to the country an air of romance I had no idea it possessed. I may perhaps be allowed to say one or two words on this region which we of the Royal Niger Company are administering under delegation by Charter from her Majesty. We have to deal, in the lower regions of the Niger and its affluents, with some of the lowest types of humanity. By degrees, and as you go inland, you reach natives of a higher type, capable of a higher organisation and of more intelligence; then gradually you come to the region where there are mixed Pagan and Mahommedan races, and finally you come to Sokoto and Gandu, the northern portions of which contain comparatively pure Mahommedan races. I should like to warn you against one great error constantly repeated in books, that is, that our part of the central Soudan is really Mahommedan as a rule. This is not so; the vast masses of the population—and I am speaking from information culled from hundreds of sources—are Pagan at heart. The ruling race are the Fellatahs, fanatical Mahommedans;

then comes the very large and important race of Haussas, the original people of those regions, and a race of traders; they have practically no religion whatever, although nominally Mahomedans. The great masses of the people of the southern regions of Sokoto and Gandu are in their superstitions and manners as Pagan as before the Fellatahs came. We have not to deal, as has been the case in India, with civilised races, but gradually to train many millions of people more or less quite unaccustomed to work. That is the first great difficulty to be encountered in all Central Africa—labour. I have already kept you longer than I intended; and having given you an idea of one difficulty we have to contend with, this should explain to you the slow progress we must expect. It will be a matter of generations before these peoples will be able to understand law, government, and work. I believe the time will come when our grandchildren will reap the fruits of what we are doing; we are laying the foundation, and must be content to raise the building a very little distance.

The CHAIRMAN: I beg to return a vote of hearty thanks to Major Macdonald for his very interesting lecture.

The Volcanic Lake of Tritriva, Central Madagascar.

By the Rev. JAMES SIBREE, Jun.

THE great island of Madagascar is not at present one of those regions of the earth where volcanic disturbances occur; but there is ample evidence, from the numerous extinct craters found in various parts of the island, that at a very recent period, geologically considered—possibly even within the occupation of the country by its present inhabitants—it was the theatre of very extensive outbursts of subterranean energy. The whole island has not yet been examined with sufficient minuteness to determine the exact extent of these old volcanoes, but they have been observed from near the south-east coast in S. Lat. 23°, and in various parts of the centre of the island up to the north-west and extreme north, a distance of 680 miles; and probably a more careful survey would reveal other links connecting more closely what is at present known as only a series of isolated groups of extinct craters. In the central provinces of Madagascar there are two large clusters of old volcanic cones and vents; one of them in and about the same latitude as the capital (19° S.), but from 50 to 70 miles away to the west of it, in the neighbourhood of Lake Itasy; the other in the district called Vâkinankàratra, situated about 80 miles to the S.S.W. of Antanànarivo, and south-west of the great central mountain mass of Ankàratra.

This second volcanic region stretches from 20 to 30 miles from Antsirabè away west to Bétâfo and beyond it, and contains numerous and prominent extinct craters, such as Ivòko, Iatsifitra, Vòhitra, Tritriva, and many others, some of which have been described by the graphic pen of the late Dr. Mullens, in his 'Twelve Months in Madagascar'

(pp. 214-219). The doctor says that he counted in this southern group about 60 cones and craters.

There are also many hot springs in this Vakinankaratra region, the most noted of which are those at Antsirabé. At this place one of the chief springs is largely charged with lime, which has formed an extensive deposit all over a small level valley sunk some 20 feet below the general level of the plain around the village. For a long time past this place has furnished almost all the lime used for building in the capital, and the central province of Imèrina. Besides the deposit over the floor of the valley, there is also a compact ridge-shaped mass of lime accretion, 70 feet long by 18 to 20 feet wide, and about 15 or 16 feet high. This has all been deposited by the spring which kept open a passage through the lime to the top. Within the last ten or twelve years, however, the spring has been tapped by a shaft, of no great depth, a few yards to the north, over which a large and commodious bath-house has been erected by the Norwegian Lutheran Mission; and here many visitors come to bathe in the hot mineral water, which has been found very beneficial in rheumatic and other complaints. A little distance to the south-west is another spring, not, however, hot, but only milk-warm, the water of which is drunk by those who bathe in the other spring. This water has been shown to be, in chemical constituents, almost identical with the famous Vichy water of France. All over the valley the water oozes up in various places; and about half a mile farther north are several other springs, somewhat hotter than that just described, to which the natives largely resort for curative bathing.

During the excavations for the foundations of the bath-house, the skeletons of several examples of an extinct species of hippopotamus were discovered, the crania and tusks being in very perfect preservation. Some of these are now in the Museum at Berlin; the finest specimen was sent to the Museum of the University of Christiania in Norway. This Madagascar hippopotamus was a smaller species than that now living in Africa, and is probably nearly allied to, if not identical with, another hippopotamus (*H. Lemerlei*) of which remains were found in 1868 by M. Grandidier, in the plains of the south-west coast. I was informed by the people that, wherever in these valleys the black mud is dug into for a depth of three or four feet, bones are sure to be met with. Probably a series of excavations would reveal the remains of animals, birds, and reptiles formerly inhabiting Madagascar. From the internal structure of the teeth and bones of the hippopotami discovered at Antsirabé, traces of the gelatine being still visible, it is evident that the animals had been living at a comparatively recent period. There have been occasional vague reports of the existence of some large animal in the southern parts of the island; possibly the hippopotamus is not yet absolutely extinct there; and perhaps the half-mythical stories of the *Songòmby*, *Tòkandia*, *Làlomèna*, and other strange creatures current

among the Malagasy are traditions of the period when these huge pachyderms were still to be seen in the lakes and streams and marshes of Madagascar.

Within a few miles of Antsirabè are two crater lakes. The nearer and larger of these is called Andràikiba, which lies distant about four miles due west. This is a beautiful sheet of water, blue as the heavens in colour, in shape an irregular square, but curving round to the north-west, where it shallows into a marsh, which is finally absorbed in rice-fields. The lake is said to be of profound depth, but the hills surrounding it are not very lofty, rising only about 200 feet above the surface of the water, from which they rise steeply. Fish and waterfowl and crocodiles also are said to be very abundant in and on its waters.

But the most interesting natural curiosity to be seen in the neighbourhood of Antsirabè is the crater-lake of Tritriva. This is situated about 10 miles to the south-west, and is a pleasant ride of two hours by palanquin. Travelling at first in a westerly direction, the road then turns more to the south-west, and skirts the southern foot of the old volcano of Vòhitra (already mentioned). Passing some mile or two south of the high ground round the southern shores of the Andràikiba lake, the road gradually ascends to a higher level of country, so that in about an hour and a-half's time we are about as high as the top of Vòhitra—probably about 500 feet. Reaching a ridge between two prominent hills, we catch our first sight of Tritriva, now about two or three miles distant in front of us. From this point it shows very distinctly as an oval-shaped hill, its longest axis lying north and south, and with a great depression in its centre; the north-eastern edge of the crater wall being the lowest part of it, from which point it rises gradually southwards and westwards, the western edge being, at the centre, from two to three times the height of the eastern side. To the north are two much smaller cup-like hills, looking as if the volcanic forces, after the main crater had been formed, had become weaker and so been unable to discharge any longer by the old vent, and had therefore formed two newer outlets at a lower level.

Descending a little from the ridge just mentioned, we cross a valley with a good many scattered hamlets, and in less than half an hour reach the foot of the hill. A few minutes' pull up a tolerably easy slope, perhaps 200 feet in height, brings us to the top, at the lowest part of the crater edge; and on reaching the ridge the crater of the old volcano and its lake is before us, or, rather, below us. It is certainly an extraordinary scene, and unique of its kind. The inner sides of the crater dip down very steeply on all sides to a deep gulf, and here, sharply defined by perpendicular cliffs all round it, except just at the southern point, is a rather weird-looking dark-green lake far below us, the water surface being probably from 200 to 300 feet lower than the point we are

standing upon, and consequently below the level of the surrounding country. The lake, exactly shut in by the cliffs of the crater surrounding it, is not blue in colour, like Andraikiba, although under a bright and cloudless sky, but a deep and somewhat blackish green. It must look, one would suppose, like ink under a stormy sky, or in the shadows of evening.

We sit down to rest and try to take in all the details of this novel picture. It is undoubtedly an old volcano we are now looking down into; the spot on which we rest is only a few feet in breadth, and we can see that this narrow knife-edge is the same all round the crater. Outside of it the slope is pretty easy, but inside it descends steeply, here and there precipitously, to the edge of the cliffs which so sharply define the actual vent and, as distinctly, the lake which they enclose. Looking southwards, the crater edge gradually ascends, winding round the southern side, and still ascending as the eye follows it to the western, the opposite side, where the crater wall towers steeply up from 200 to 300 feet higher than it does on the east, where we are standing. The lake we judge to be about 800 to 900 feet long and 200 to 250 feet wide, forming a long oval, with pointed ends. The cliffs which enclose it appear to be from 40 to 50 feet in height, whitish in colour, but with black streaks where the rain, charged with carbonic acid, has poured more plentifully down their faces. These cliffs are vertical and in some places overhang the water, and from their apparently horizontal stratification are no doubt of gneiss rock. In coming up the hill I noticed a few small lumps of gneiss among the basaltic lava pebbles. The strongest feature of this Tritriva is the sharply defined vertical opening of the vent, looking as if the rocks had been cut *clean through* with an enormous chisel, and as if they must dip down—as is doubtless the case—to unknown depths below the dusky-green waters. At the northern end of the lake is a deep gorge or cleft, partly filled with bushes and other vegetation. Southward of this, on the eastern side, the cliffs are still lofty and overhang the water, but at about a third of the lake's length they gradually decrease in height, and at the southern point they dip down to the level of the lake, so that at that part only can the water be approached. On the western side the cliffs keep a pretty uniform height all along the whole length.

So steep is the inward slope of the crater walls, that we all experienced a somewhat "eerie" feeling in walking along the footpath at its edge; for at a very few feet from this a false step would set one rolling downwards, with nothing to break the descent to the edge of the cliffs, and then to the dark waters below. Yet there was a strange fascination in the scene, and the variety and contrast and depth of the colours would make the Tritriva lake and slopes a striking subject for a painting from many different points along its crater wall. When we arrived, the sun, yet wanting an hour and a half of noon, was still

lighting up the grey-white stone of the western cliffs, but the shadows were every minute growing more intense as the sun became more nearly vertical. Far below us was the deep-green oval lake; above it, the stratified gneiss cliffs with their black streaks, diversified here and there by patches of bright-green bush. Then again from their edges sweep steeply upwards the grey-green sides of the crater, culminating in the lofty western ridge opposite to us. And over all was the blue sky flecked with cirrus clouds; altogether a scene such as I have seen nowhere else in Madagascar, or, indeed, in any other country.

After fixing in our minds the view from the north-east, we proceeded southwards along the crater edge to the higher part at the south-east, where the view is equally striking, and the depth of the great chasm seems still more profound. Here we waited some time, while most of our men went down to one of the hamlets in the plain to the east to get their meal, in which quest, however, they had only poor success. On expressing a wish to taste the Tritriva water, one of our bearers took a glass, and descending by a breakneck path, went to fetch some water from the lake. He was so long away that we were beginning to feel uneasy, but after a quarter of an hour, he reappeared with the water, which tasted perfectly sweet and good. He also entertained us with some of the legends which were certain to have grown up about so weird looking a place as Tritriva. Pointing to two or three small trees or bushes growing on the face of the cliffs near the northern point of the lake, he told us these were really a young lad and lass who had become attached to each other; but the hard-hearted parents of the girl disapproving of the match, the youth took his loin-cloth, and binding it round his sweetheart and his own body, precipitated her with himself into the dark waters. They became, so it is said, two trees growing side by side, and they now have offspring, for a young tree is growing near them; and in proof of the truth of this story, he said that if you pinch or break the branches of these trees, it is not sap which exudes, but blood. He appeared to believe firmly in the truth of this story.

He also told us that the people of a clan called Zànatsàra, who live in the neighbourhood, claim some special rights in the Tritriva lake; and when any one of their number is ill, they send to see if the usually clear dark-green of the water is becoming brown and turbid. If this is the case they believe it to be a presage of death to the sick person.

Another legend makes the lake the former home of one of the mythical monsters of Malagasy folk-lore, the *Fanànim-pìto-lòha* or "seven-headed serpent." But for some reason or other he grew tired of his residence, and shifted his quarters to the more spacious and brighter lodgings for seven-headed creatures afforded by the other volcanic lake of Andràikiba.

This same bearer assured us that in the rainy season—contrary to what one would have supposed—the water of the lake diminishes, but

increases again in the dry season. He told us that there is an outlet to the water, which forms a spring to the north of the mountain. I noticed a white line a foot or two above the surface of the water all round the foot of the cliffs, showing a probably higher level than at the time of our visit. The lake is doubtless profoundly deep. I was told that a few years ago Mr. J. Parrett sounded it with a line 600 feet long, but found no bottom at that depth.

Walking round to the southern end of the crater edge, the lake, here foreshortened, has a somewhat close resemblance in outline to that of the Lake of Galilee, as seen on maps; but I must confess that the first sight of it in its deep chasm made me think much more of the other lake of Palestine, the Dead Sea, in its profound gorge between the Judean hills and the highlands of Moab. After making a slight pencil sketch or two, I proceeded up the far higher saddle-back ridge on the western side. Here the lake seems much diminished in size, and lying far down at an awful depth. But a magnificent and extensive view is gained of the surrounding country; the long flat-topped lines of hill to the east running many miles north and south, and surrounded directly east by two perfect cones (old volcanoes, Votovòrona and Ihankiana) the peaked and jagged range of Vòambòrona to the south-east; the enormous mass of Ibity to the south; and then west, a flat region broken by abrupt hills; to the north-west are the thickly populated valleys towards Bètàfo, with many a cup-shaped hill and mountain marking old volcanic vents; and beyond this a high mass of country, with serrated outline against the sky, showing the district of Vavavàto and the peaks of Iàvohàika; and finally, coming to due north is the varied grouping of the hills which form the northern termination of the central mountain mass of Ankà-ratra. Between us and these again is the extensive plain of Antsirabè, with the white walls and gables of the church and the mission buildings plainly visible in the bright sunshine, although 10 or 11 miles distant—altogether a panorama long to be remembered. From this point also the significance and appropriateness of the name given to the old volcano is clearly seen: Tritriva is a combination of the words *trity*, a word used to describe the ridge on the back of a chameleon or a fish, and *iva*, low, deep; so that the name very happily describes the long steep western ridge or crater wall, and the deep chasm sweeping down from it.

It may be added in conclusion, that the slopes of the crater both inside and out are covered over with turf, which grows on a dark-brown volcanic soil, mingled with rounded pebbles of greenish or purple lava, very compact and close in structure, and containing minute crystals scattered sparingly through it. Occasional blocks of this are found round the edge of the crater wall, and the same rock crops out at many places on the steep inner slopes. I did not notice any vesicular

lava or scoria; and at a little homestead not far from the north-eastern foot of Tritriva, I was surprised to find the *hàdy* or fosse dug to 12 or 14 feet deep almost entirely through the red clay or earth found all through the central regions of the island. The dark-brown volcanic soil, here seen in section, appeared to be only 18 inches deep, with layers of small pebbles. So that the discharge of the volcanic dust and ash appears to have extended only a short distance from the mountain, at least it does not appear to have been very deep, unless, indeed, there has been much denudation. It must be remembered, however, that this point is to the windward side of the hill; probably the volcanic soil is deeper to the west of it. The much greater height of the western wall of the crater is no doubt due to the prevailing easterly winds carrying the bulk of the ejected matter to the west, and piling it up to two or three times the height of the eastern side. After seeing the amount of gneiss rock which must have been blown out of the vent, I expected to have found much greater quantities of it, and in larger blocks, than the very few and small fragments actually seen on the outer slopes. The greater portion, however, is probably covered up under the quantities of volcanic dust and *lapilli* which were subsequently ejected.

Tritriva, it will be evident from this slight sketch, will greatly interest those who have a taste for geology and physical geography; while its peculiar and somewhat awe-striking beauty makes it equally worthy of a visit from the artist and the lover of the picturesque. Certainly it has become photographed upon our memory with a distinctness which will render it a vivid mental picture for many a day to come.

GEOGRAPHICAL NOTES.

Mr. Theodore Bent's Explorations at Zimbabwe.—A telegram from the Cape appeared in the daily papers of the 23rd July, announcing the discovery by Mr. Bent, in the course of his excavations at Zimbabwe, of images and pottery supposed to be of Phœnician origin. Important finds of this nature were expected, and we look forward with interest to news of the discovery, with details, from Mr. Bent himself; at present we have no information from him direct.

The International Congress of Geography at Berne.—The Berne meeting of this Congress commences on the 15th August next. The Delegates appointed to represent our Society at the Congress are the Right. Hon. Sir George Bowen, G.C.M.G., Dr. R. N. Cust, Admiral Sir Erasmus Ommanney, Mr. Delmar Morgan, and Mr. J. Scott Keltie. Among the subjects to be discussed at the Congress is the production, by

international co-operation or otherwise, of a complete map of the world on the scale of 1:1,000,000, i. e. about 16 miles to the inch, a map which, printed in sheets of the size of an ordinary atlas, would require more than 3000 such sheets for the complete representation of the land and sea surface of the globe.

The British Association: Geographical Section.—The meeting of the British Association, to be held this year at Cardiff, commences on the 19th August. The Geographical Section will be under the presidency of Mr. E. G. Ravenstein, whose address will deal with the development of graphic cartography, a subject on which he is one of our highest authorities. The papers already in hand comprise several of great interest on the scientific aspects of geography.

Progress of M. Crampel's Mission to Lake Chad.—News has been received of the arrival of M. Crampel's expedition early in April at the southern limit of the Baghirmi country, within a short distance of the river Shari. As we have previously announced,* M. Crampel left the river Ubangi for the march to Lake Chad early in December last. He appears to have been well received by the chiefs of the remote interior country, and has continued his route towards the north.

A Journey from Tehran to the Karun and Mohamrah.—The Foreign Office has just published a report by Major-General T. E. Gordon on a journey made by him last year from Tehran to the Karun and Mohamrah. General Gordon gives much valuable information as to the character of the country which he traversed, its agricultural prospects, and the state of the roads and other means of communication. For the greater part of his journey he was accompanied by Mr. Macqueen, the engineer of the Road Company Syndicate, which has obtained a concession for improving communications in Persia. At present the representatives of the European firms at Sultanabad use the Kermanshah-Bagdad route, on which the fullest facilities have of late been given for through transit. Goods are consigned to an agent in Bagdad who passes them on by river for sea shipment at Busrah. But with a good road and a well-organised transport service under European control, the Karun route should not fail to cut out its rivals.—The high country beyond Sultanabad, stretching up to the ridge of the range (8000 feet), dividing its district from that of Burujird, is well cultivated in wheat and barley for the Tehran market. This cultivation is carried along the hill-slopes and right over the summits of the rounded hills, which are almost all covered with rich soil, no rock showing; but cultivation here is said to have increased largely of late years. Here General Gordon saw for the first time large herds of small black cattle, which, with the usual great flocks of sheep, find good grazing on the extensive Burujird plain. This plain is little cultivated, but is rich in pasture,

* See *ante*, p. 227.

and having abundance of water, it shows grand agricultural capabilities. General Gordon had heard that the road between Khoremabad and Dizful had been put in some sort of repair. At Dizful the very ancient bridge over the Diz stream was broken last year by a high flood, but has been temporarily repaired to allow of free traffic to the town. The caravan trade with Amarah on the Tigris (by four long stages) is still carried on notwithstanding Turkish customs troubles, but it is gradually falling away to Mohamrah. Shuster, which is thirty-six miles from Dizful and about 480 miles from Tehran, has suffered heavily by the break in its ancient bridge, known as Valerian's. Several of its arches were carried away by an unusually high flood in the spring of 1885, and the bank on which the bridge rested was burst. The water-level being thus lowered by the river flowing through the break, the Mirjan-ab canal on the left bank was emptied, and the large tract of fertile land south of Shuster, being deprived of its irrigation, became and continues to remain untilled. The loss of this canal irrigation has told heavily upon the population of the place, the great majority of whom depended for their living on the irrigated area. A large number of the inhabitants emigrated into neighbouring Turkish territory, where watered lands were available.—A little below Shuster, General Gordon got on board the *Susa*, a steel launch of 70 tons. From its roof he had a good view of the flat country all round, and the dense jungles on the banks of the three streams. He observed great patches of oil-smooth water floating down the Karun from Shateit branch. These were oil-spreads from the petroleum springs near Shuster, which always give a large overflow after much rain. There had been a heavy fall a few days before, followed by the usual flush into the river. At Ahwaz, which is 60 miles by river from Shuster, General Gordon met the Muayin-ut-Tujjar, who is at present the moving spirit of private enterprise at Ahwaz. Seven months ago he commenced building a caravanserai, which is now finished, in so far as it is fit for comfortable occupation. He is now engaged in constructing a tramway three feet wide, of light steel rails, laid on sleepers cut in the Karun jungles. The line runs from the river bank at the caravanserai into the serai. About 150 yards of rail are already laid, and the work is being carried on steadily. A river-face wall is being built behind the serai, where native craft lie, and the intention is to use the tramway at once for removal of material from its cuttings and vicinity with which to fill in and level-up the hollow ground between the serai and the embankment. The opening of the Karun has already had a marked effect on the well-being of the Arab population. Labour at 1 kran (8d.) a day has put many in the space of a year in possession of sufficient capital to buy a pair of donkeys and a plough (donkeys do most of the plough work in Arabistan), and seed-corn wherewith to cultivate Government lands on their own account, besides leaving a small balance in hand with which to live,

without having to borrow at robbery rates on the coming crop. The sheikhs, who before had a full command of labour in return for little more than the simplest food, now find this condition of things rapidly changing, so many of the poor who depended on them having started as small farmers. It was a sight, General Gordon says, to see the whole Arab population on the river banks hard at work, taking advantage of the copious rain which had just fallen, every available animal fit for draught was yoked to the plough—horses, mules, bullocks, and donkeys, and even mares with their foals following them up the furrows. The land tax is light, and every encouragement appears to be given to cultivators. The agricultural resources of the Karun are likely soon to be developed with the aid of foreign capital. General Gordon heard of several individuals and parties trying to obtain long leases of land on the banks of the river for the cultivation of sugar-cane, cereals, cotton, and the date-palm. The point on which a difficulty is experienced is a sufficiently long period of lease, sixty years being asked and twenty offered. There is no doubt that concessions will eventually be given to Persian subjects and sold in part to the present applicants. The capabilities of the Lower Karun lands for date cultivation are great and are sure to attract planters soon. The date supply keeps increasing year by year, and so does the demand. An acre of ground holds 100 trees. They bear fruit at five years, and reach full fruition at seven. In a fairly good season a tree in full bearing gives an average profit of three rupees, at which rate the acre would return 20*l.* a year. While the trees are growing up, the ground, with the irrigation which they require, yields a crop of wheat, clover, or grass, and later can be managed to afford pasture, there being but little heavy shade thrown by the feathery foliage above. One hundred and sixty varieties of dates are said to be distinguishable in these palm districts by the native growers by some difference or peculiarity in fruit or stone, leaf or stem. The Arabs pay close attention to conditions of climate, soil, water, and place, so as to cultivate the date to the best advantage.—As to the proposed new road, General Gordon says there can be no doubt of the difficulty which will be experienced in making it at small cost. From the first there seems to have been an idea that it could be made the whole length of 500 miles, at an average of 20*l.* a mile. Perhaps the idea was the outcome of a report that such an estimate had actually been made a few years ago. If so, a mistake has been made in supposing that a commercial cart-road was meant; there is a vast difference between a cart-road for use in a campaign and one to be a permanent highway. The existing road between Sultanabad and Burujird, and on to Khoremabad, presents no very great difficulty, but to make it well passable for carts will entail considerable expense in securing an easy line over the intervening ranges. The liquorice plant flourished in great luxuriance and abundance on the Burujird and Khoremabad plains and in the interven-

ing valleys, and the plains at Kermanshah were said to be covered with it. At Shuster it was not very plentiful, and there was not much of it lower down in the valley. The root is greatly in demand in America for use in preparation of quid tobacco and fancy drinks, but until the large supply in Asia Minor, still available near railways and steamers, is exhausted, the cost of carriage from the localities mentioned would kill all chance of profit at present prices.

Census of Cape Colony.—The Director of the Census in Cape Colony has published a preliminary report, which contains much more detailed information than is yet available for most of the other colonies. The grand total for this year, irrespective of colour or race, is 1,525,739, as compared with 1,028,966 at the date of the last census, which for the old colony was 1875, but for Griqualand West was 1877, and for the Native Territories 1879. In 1875 the colony as it then stood had a population of 720,984, comprising 236,783 Europeans or white people, 287,630 aboriginal natives (including all Kaffirs, Fingoes, Bechuanas, Damaras, &c., belonging to the Bantu race, male and female), and 196,571 other coloured people (including Hottentots, Malays, and other Cape-born coloured persons, also Chinese, Indians, and other foreigners of coloured races). In 1891 the figures were:—(1) White population, 337,000; (2) aboriginal natives, 340,405; (3) other coloured people, 277,879: total, 955,284. The increase in the sixteen years since the former census amounts to 32·50 per cent. of the total population; the largest increase being among the whites, whose percentage of increase was 42·32; the aboriginal natives only increased 18·35 per cent., but the other coloured races have pressed the whites hard, their percentage of increase being 41·36. The great relative increase of the white or European population is also brought out in the following figures, which represent the percentage of population of the three divisions at the last census periods:—Whites, 1875—32·84, 1891—35·28; aboriginal natives, 1875—39·90, 1891—35·63; other coloured people, 1875—27·26, 1891—29·09. In Griqualand West the population, in 1877, was 45,277, made up of 12,374 Europeans or whites, and 32,903 aborigines and other coloured peoples; in 1891, the number of inhabitants is 83,115, of whom 29,469 are whites and 53,646 are coloured. These figures show that during the fourteen years in question the proportion of white and coloured population has materially altered. In 1877, only 27·33 per cent. of the population was white; in 1891, the proportion is 35·46 per cent. In the third section—the native territories annexed since 1875—the earliest figures available are those for 1879, when the population stood at 262,705, of whom only 2561 were white. In 1891 the total population was 487,340, but the white population now numbers 10,343. In only nine census districts do the Europeans in 1891 outnumber the coloured races, the highest percentage being 56·15 in Piquetberg. The Europeans in the Cape division very nearly equal

50 per cent. of the total population. In eleven districts in the Transkei, and in the division of Herschel, the white population falls below 1 per cent. of the total population. As regards the proportion of the sexes, there is a marked increase in the number of females, which the director of the census attributes to the annexation of the native territories since the last census. In 1865, to every 100 males of the total population there were 94.08 females. In 1875 there were 95.06. In 1891, the proportion has now become 99.03 females to every 100 males. The report further deals with the age periods of the population in urban and rural districts, and there are also some interesting figures illustrative of the density of the population and the average number of acres per head of the population. In 1865, the average density of the population was 2.52 persons to the square mile; in 1875, there were 3.60 to the square mile; in 1891, the number has increased to 6.890. In 1891, the average number of acres per head of the population was 128.3 in the Colony Proper, 117.0 in Griqualand West, and 19.3 in the native territories.

The Population of Jamaica.—A preliminary report has been issued by the Registrar-General, giving the result of the census taken in the island of Jamaica on the night of the 5th of April last. Detailed information is at present wanting, but the total population is returned as 639,491. Of this number, 305,948 were males and 333,543 were females. These figures show an increase of 58,687 in the population of the island since 1881, when the figures were—total population, 580,804; males, 282,957; females, 297,847. It is noticeable that while the male population has only increased by 22,991, the female population has increased by 35,696, or, in other words, that while the male population is only a little over 8 per cent. greater than in 1881, the female population during the last ten years has increased almost 12 per cent.

Census of Victoria.—Approximate returns, compiled from the enumerators' summaries, have been prepared by the Government statist, of the census for the colony of Victoria. From this document it appears that the total population of the colony on April 5th was 1,137,272; of whom 8137 were Chinese, including half-castes, and 584 were aborigines, also including half-castes. Of the 1,128,551 inhabitants of the non-Chinese or aborigines population, 589,076 were males and 539,475 were females. Of the Chinese only 376 were females; while of the aborigines 352 were males and 232 females. The number of inhabited dwellings in the colony was 222,832; of uninhabited, 17,461; and of those in course of erection, 1739; making a total of 242,032. The population in 1881 was 862,346, so that the increase in the last ten years amounts to 274,926. Of this increase, 145,106 are males; 129,820 are females. In 1881 there were 179,816 dwellings in the colony, so that the increase

for the ten years is 62,716, or nearly 35 per cent. Melbourne and its suburbs is credited with 488,999 inhabitants in 1891, as against 283,373 in 1881; while the number of dwellings has increased with equal rapidity, the figures being 54,192 in 1881, and 96,444 in 1891, or an increase during the ten years of 42,252 dwellings.

Obituary.

R. H. Major, F.S.A.*—Richard Henry Major, whose recent death we have to record, belonged to the same family as Mr. Major of Dursley, the friend and correspondent of the great Protector, and the father-in-law of Richard Cromwell. He was born in 1818. His father, Mr. Richard Major, was a favourite pupil of the famous Dr. Abernethy, and had barely commenced what promised to be a successful career in the medical profession when his life was cut short at the early age of twenty-nine, his son being then only three years old. The widow married again, and Richard Henry, with the other children, was taken into the care and guardianship of their grandfather, Joseph Major, whose only child their father had been. With him he lived till the grandfather's death in 1835.

Mr. Major was educated at Merchant Taylors' School. During some part, if not all, of his school life, to the age of 18, the Rev. J. J. Ellis was second master and this led to a life-long friendship with his brother Sir Henry Ellis, Principal Librarian of the British Museum, which in its turn led to his entering the service of that great National Institution. On leaving school he acquired a knowledge of the Spanish language, being already master of the French, and these linguistic acquirements formed one practical reason for his joining the late Mr. Bell, of Norris Castle, and his son, on an eight months' yachting tour in the Mediterranean; with Mr. Bell he remained on terms of close friendship until the death of the former. It was in 1843 that Sir Henry Ellis suggested his entering the Museum; an opportunity of applying his special tastes for research which he gladly accepted. He married, in 1847, Sarah Elizabeth Thorn, who was an accomplished artist, and who, during their long and happy married life, interested herself in all his arduous literary work.

Mr. Major's post during many years, at the British Museum, was that of keeper of maps and charts, and he acquired a profound knowledge of mediæval and later cartography. Besides being an accomplished linguist he was a good scholar, so that he had every qualification when, more than forty years ago, he undertook, under the presidency of Sir Roderick Murchison, to guide the destinies of the Hakluyt Society. It was Mr. Desborough Cooley who began this work, and he was the first Secretary of a Society which was founded for reprinting and editing narratives of voyages and travels previous to the commencement of the eighteenth century. But Mr. Cooley threw up the task in despair after the first year, declaring that the attempt must fail through absence of competent editors in this country, and lack of interest in the subject. In these depressing circumstances Mr. Major became Secretary of the Hakluyt Society, and under his able management during upwards

* By Clements R. Markham, F.R.S.

of ten years, the Society became a great success; the volumes issued by it being valued and appreciated by students of comparative geography throughout Europe, America, and Australasia. This success was due to Mr. Major's unequalled knowledge of the subject, to his wide acquaintance with fellow labourers in the same field of research, to his readiness to impart his own stores of knowledge to others, and not least to his generous sympathy in the work of editors, and to the charm of his manners and conversation. But the fame of the Hakluyt Society rests, in no small degree, on the works edited by Mr. Major himself.

His editions of Stacey's 'Virginia Britannia,' of Herberstein's travels in Russia, and of early voyages to India and China, were and are still indispensable to the student of historical geography; but his most important works were his 'Select Letters of Columbus' which went through two editions, his 'Early Indications of Australia,' and his 'Voyages of the brothers Zeni.' He discussed the question of the first landfall of Columbus exhaustively, and with great ability; and, although Watling Island had been previously advocated by Muñoz and by Admiral Becher, to Major undoubtedly belongs the credit of having established the exact position off that island where the three caravels of Columbus first cast anchor. This interesting point is discussed in the second edition of his 'Select Letters,' and was still more fully established in an interesting paper, entitled, "The Landfall of Columbus," read by Mr. Major at an evening meeting of our Society on the 8th May, 1871.* The 'Early Indications of Australia' is a work of lasting importance. It is the first chapter of the history of our great southern dependencies; and is indispensable to the Australasian student. No history of his country could be written without reference to it. Mr. Major also bestowed great pains and labour on the disputed questions relating to the voyages of the Zeni; and his acute criticism has thrown light on several obscure points. He maintained that the Frislanda of the Zeni was identical with the Faroe Islands.

Among Mr. Major's numerous valuable contributions to the literature of comparative geography one of the most interesting was suggested by a critical examination of a *mappe-monde* of the sixteenth century, now in the collection at Windsor Castle. He believed it to be the work of Leonardo da Vinci. In his paper on the subject, printed in the *Archæologia* in 1866 (vol. xli. p. 1), he showed that this globe was the first on which the name "America" appeared, and his discussion of the way in which this name originated is an admirable specimen of Mr. Major's method of work, combining great erudition and careful research with close and thoughtful criticism.

But the great work of Mr. Major's life was his biography of Prince Henry the Navigator. That enlightened encourager of maritime enterprise and discovery had never before found a biographer in this country. Prince Henry was half an Englishman, and England, as a great maritime country, owes him much. Mr. Major deserves the gratitude of the English, as well as of the Portuguese nation, for having paid the debt due to the memory of Prince Henry. He not only brought together all that was known of the Prince himself, and placed his noble character and his great services in their true light; but he also showed the practical results and consequences of those services, and of that enthusiasm and ardour which were first aroused by the persevering labours of him whose motto was "Talent de bien faire." First in modern times Prince Henry lighted the beacon of geographical research which was passed from hand to hand until it now illumines the whole world. The biography of such a man was a great and difficult task. It could not

* Published, with maps, in the 'Journal R.G.S.,' vol. xli. p. 193.

have been undertaken by one better qualified in every respect through previous study and enthusiasm for his subject, and Prince Henry was fortunate in his biographer. The 'Life of Prince Henry the Navigator' is a work that will endure. He was made a Knight of the Tower and Sword of Portugal in recognition of his services as biographer of Prince Henry.

Mr. Major retired from the Secretaryship of the Hakluyt Society in the end of 1858, but he continued on the Society's Council until his death, and was ever ready to give his time and assistance to his successor in the conduct of work which he loved so well. In 1866 he became one of the Secretaries of the Royal Geographical Society, and after his retirement owing to ill health in 1881, he was for three years one of our Vice-Presidents.

Throughout the later years of his life he suffered much in health. In 1877 he had a severe attack of bronchitis and congestion of the lungs, and each winter brought a return of affliction. In the winter of 1879-80 he was very seriously ill, and for the first three months of the new year resided at Torquay, receiving much benefit from the change; but in the following autumn he was advised, if possible, to winter abroad, so he resigned his post at the Museum and went to Algiers for the winter, returning in May 1881, greatly improved. In the January of 1884 his health again failed; later in the year complication of various kinds set in and he continued an invalid until the end of 1888, when a long residence in Italy was determined on. He proceeded thither with his entire family and recovered health and vigour sufficiently to enjoy his pleasant residences in the Italian cities. The chronic disorder however remained, and not long after his return home, in May last, he was suddenly attacked with high fever and subsequent inflammation, and died on the 25th of June.

THE ANNIVERSARY MEETING, JUNE 15TH, 1891.

The Right Hon. Sir MOUNTSTUART E. GRANT DUFF, G.C.S.I., President,
in the Chair.

ELECTIONS.—*Ildefonso José D'Abreu, Esq.*; *Rev. E. Tremayne Dunstan*; *Henry Colthurst Godwin, Esq.*; *General William Osborn (Madras Army)*; *Rev. William Pilot*; *Colonel D. H. Traill, R.E.*; *John Whitehead, Esq.*; *Vaughan Williams, Esq.*; *Scott Barchard Wilson, Esq.*

At the commencement of the proceedings, the Secretary (Mr. H. SEEBOHM) read the rules which govern the business of Anniversary Meetings, and the Minutes of the last Annual Meeting, June 16th, 1890.

The President next appointed Mr. M. BEAZELEY, C.E., and Mr. J. F. POWNALL Scrutineers for the Ballot about to take place.

PRESENTATION OF THE ROYAL MEDALS.

The Royal Medals for the Encouragement of Geographical Science and Discovery had been awarded by the Council as follows:—

The Founder's Medal to Sir JAMES HECTOR, M.D., K.C.M.G., F.R.S. (Director of the Geological Survey, &c., of New Zealand); for the great services rendered by him to geography and the allied sciences by his various papers on the physical features, geology, and climate of British North America, the result of investigations pursued under great difficulties whilst serving as Naturalist to the Palliser Expedition of 1858.

Also for the long series of admirable papers contributed by him to English and Colonial journals, during his residence of upwards of a quarter of a century, on the geology, thermal waters, lake and fiord formations, rock basins, earthquake waves, meteorology, and volcanic phenomena of New Zealand.

The Patron's Medal to Dr. FRIDTJOF NANSEN; for having been the first to cross the inland ice of Greenland, a perilous and daring achievement, entailing a journey of more than three months, thirty-seven days of which were passed at great elevations, and in the climate of an arctic winter; obliging him to lead a forlorn hope with the knowledge that there could be no retreat, and that failure must involve the destruction of himself and his companions; and calling forth the highest qualities of an explorer. For having taken a series of astronomical and meteorological observations under circumstances of extreme difficulty and privation, during a march which required exceptional powers of strength and endurance, and mental faculties of a high order, as well as the qualities of a scientific geographer for its successful accomplishment. And for his discovery of the physical character of the interior of Greenland, as well as for other valuable scientific results of his expedition.

Sir FRANCIS DILLON BELL, K.C.M.G., C.B., Agent-General for New Zealand, attended to receive the Medal on behalf of Sir James Hector.

The PRESIDENT addressed him as follows:—It gives me the greatest satisfaction to hand to you, who represent in the mother-country her great colony of New Zealand, the Founder's Medal of the Royal Geographical Society, which has been assigned this year to a very distinguished servant of the New Zealand Government. Sir James Hector had, even before he went to New Zealand, won a high place amongst men of science by his papers on the physical features, geology, and climate of British North America. His chief investigations into these were pursued as far back as 1858. It was in his destiny, however, to devote the principal part of his life to a region far removed from British North America. For more than five-and-twenty years he has been acquiring and communicating knowledge on the thermal waters, earthquake waves and volcanic phenomena, as well as on the general geology and meteorology of his new home. He could not have pursued his studies either in America or in New Zealand successfully without making great contributions to that science to which we are specially devoted, and for the furtherance of which these medals have been entrusted to us. It is because he has done this that it is our duty to do him honour, and you will, I trust, communicate to him the thanks and good wishes of all here assembled.

Sir F. DILLON BELL replied in the following words:—It is with very great pleasure and pride that I find myself here to receive the Medal on behalf of Sir James Hector. It would be an impertinence on my part to refer to his signal scientific services, but speaking as I do as the official representative of the New Zealand Government in this country, I may be allowed to say that, quite outside his services to science, Sir James Hector has been able to render the very greatest services to the Government of New Zealand in a great many ways; and this no one knows better than Sir George Bowen, who was for a long time Governor of New Zealand, and whose distinguished career is familiar to you, excepting perhaps myself, who have been a companion of Sir James for many years, although I was not competent to help him in his scientific researches. I shall be happy to convey to him the sentiments you have expressed on behalf of the Royal Geographical Society.

In presenting the Medal to His Excellency M. AKERMAN, Minister for Sweden and Norway, who represented Dr. Nansen on the occasion, the President said:—It gives me much pleasure to welcome your Excellency in the name of this Society. Your having come here to do honour to your countryman, who has, at so early a period of life, made a mark both as a traveller and as a recorder of his

travels, shows that you entertain the same enlightened sentiments with regard to science and literature which are so characteristic of the illustrious monarch whose representative you are. Dr. Nansen's expedition, which took him across the inland ice of Greenland, has excited a peculiarly wide and general interest in this country, where feats of heroism and endurance are ever held in high esteem. He showed in the course of it some of the best qualities of an explorer. If, however, he had done nothing more than this, it would not have been in the power of our Society to count him amongst its Medallists; but he has made a substantial addition to human knowledge by proving what was merely guessed at before, the physical character, namely, of that portion of Greenland which he crossed. He took, too, a series of astronomical and meteorological observations under circumstances so exceptional, that to any one who had not great determination and a very strong character, as well as a desire for the advancement of science, they would have presented insuperable difficulties. These services to geography bring him within the category of those whom we are permitted to honour in this way, and it is a great satisfaction to us to do so. We trust that you will tell Dr. Nansen that we hope he may be at least as successful in his next and in all his other enterprises as he was in the crossing of Greenland.

His Excellency, on receiving the Medal, spoke as follows:—It will be a most agreeable duty for me to forward to my fellow-countryman the Medal as a mark of the high distinction that the Royal Geographical Society has bestowed upon him, and I am sure that it will afford him great encouragement in the perhaps more important exploration which he is preparing for now, and which prevents him receiving the honour personally. I will also forward to him the very kindly terms which you have been pleased to use.

OTHER AWARDS.

The PRESIDENT then announced that the Council had awarded the Murchison and other premia of the year as follows:—

The MURCHISON PREMIUM for 1891, to Mr. WILLIAM OGILVIE, for his two years' continuous explorations in the Mackenzie and Yukon region of British North-west America, during which he made instrumental and track surveys covering a distance of 2700 miles, and gleaned much valuable information regarding the physical geography and products of the country.

The CUTHBERT-PEEK GRANT, to Lieut. B. L. SCLATER, R.E., for additional instruments to enable him to determine longitudes of positions in the exploration of Nyassaland by Mr. H. H. Johnston.

The GILL MEMORIAL, to Mr. A. E. PRATT, for his two journeys in Western Sze-chuen, on the confines of Tibet, and the important additions he has made to our knowledge of the geography and zoology of that little-known region.

The BACK GRANT (one year) to Mr. W. J. STEAINS, for the carefully plotted map of the Rio Doce and its tributaries, based on upwards of 4000 magnetic bearings and careful dead reckonings, made during an adventurous exploration undertaken at his own risk and cost, which he communicated to the Society together with a paper on his journey, and which were published in the 'Proceedings' for February 1888.—The same Grant (one year) to Dr. DAVID KERR CROSS, in recognition of the value of his observations on the country and natives of the region north of Lake Nyassa, published in the 'Proceedings,' February 1891.

The Murchison Premium, which was in the form of a chronometer watch with a suitable inscription, was presented to Mr. J. G. COLMER, Secretary to the High Commissioner for Canada, who attended for the Hon. Sir CHARLES TUPPER, Bart., in the absence of that gentleman on the Continent. The PRESIDENT said:—It is the more

agreeable to me to entrust to you the Murchison Grant on behalf of Mr. Ogilvie because the Society is aware that the authorities in Canada take a great interest in the work of that very meritorious explorer, and will be glad to see it recognised by us. Our 'Proceedings' for the month of September last contained a summary of a very interesting paper by Dr. Dawson, of the Canadian Geological Survey, from which we learn that between one-third and one-fourth of the whole territory of the Dominion is still unexplored. It will require the efforts of some generations of men as able and as devoted as Mr. Ogilvie, before that vast area has been completely traversed and mapped. We trust, and we know, that many will follow in his footsteps.

Mr. COLMER replied:—I am quite sure that Sir Charles Tupper, who is at present in Vienna, will be pleased to forward the Society's award to Mr. Ogilvie, and that it will be much appreciated by the Government of Canada and every Canadian. I believe that this recognition of the excellent work Mr. Ogilvie has done will stimulate other Canadians to follow his example and endeavour to tell us more of the country in the far north and north-west of Canada than we know already.

PRESENTATION OF THE TRAINING COLLEGE PRIZES.

The Scholarships and Prizes offered by the Society to the students of Training Colleges, for Proficiency in Geography at the Examinations in December last, had been awarded by the Examiners of the Education Department to the following:—

MALE STUDENTS. *Scholarship*: Herbert Vigrass, Saltley College; *Prizes*: Richard M. Hayman, Exeter College; William H. Freemantle, Exeter College; William Jackson, Westminster College; Frederick C. R. Frost, Westminster College. FEMALE STUDENTS. *Scholarship*: Bertha Sills, Tottenham College; *Prizes*: Ada Taylor, Southlands College; Eliza Wood, Stockwell College; Silvester Schaeffer, Tottenham College; Elizabeth Sinclair, Stockwell College (the first three equal)*

Mr. H. J. MACKINDER (Reader in Geography at Oxford), who had been requested to introduce the successful students, said:—I have been asked to say a few words with reference to the prizes and the exhibitions which are about to be presented to those who come from the Training Colleges of England. My duties bring me into contact chiefly with another part of the Society's work, but in connection with this matter, I may, perhaps, state a fact which Mr. Bates tells me is probably not generally known among the Fellows of the Society; and that is, that the Council of the Society

* The MEDALS, for the Promotion of Geographical Education, placed by the Society at the disposal of the syndicates respectively of the Oxford and Cambridge Local Examinations, were awarded as follows:

1890. Oxford (June).—*Bronze Medal*—Bessie Jones, Liverpool. (*Silver Medal* not awarded.)

Cambridge (December).—*Silver Medal*—(Physical Geography)—Amy Flora Macdonald Johnson. *Silver Medal* (Political Geography) Richard Towneley Whitaker.

The PRIZE ATLASES offered by the Society for Geographical Proficiency to the cadets of the Nautical Training Colleges, on board H.M. ships *Worcester* and *Conway*, were awarded, at the examinations, held in July 1890, to the following: Alfred Phillips Parmeter (*Worcester* training ship); Sidney Thompson Stephens (*Conway* training ship).

does in one sense exercise a control over the Examinations, upon the results of which these awards are made. The Education Department is kind enough annually to invite the Council of the Society to send two delegates to the Department for the purpose of reading through the geographical papers to which the Government Examiners had adjudicated the Society's prizes, so that if at any time the delegates reported to the Council that the papers were not up to a high standard it would be open to the Society to withdraw the prizes which it now offers. The delegates, however, have from year to year reported that the papers were of high merit as regards the scope of the subject and the amount and accuracy of knowledge displayed. The result has been such as to give great satisfaction to the Society and the Colleges; and the Society and Department are working in an efficient and friendly way together.

I have prepared, or rather brought up to date, the analysis made on previous occasions. These prizes have now been awarded for four years. Twenty-one prizes have during that period been given to male students and twenty-one to female. Of the male students six have come from the Borough Road College, three from Cheltenham, three from Westminster, two from Battersea, two from Exeter, and one from each of the following,—York, Chester, Culham, Chelsea, and Saltley. Of the female students three have come from Stockwell College, and three from Lincoln; two from each of the following Colleges,—Tottenham, Southlands, White-lands, Salisbury, and Chichester, while one has come from each of the following,—Derby, Edge Hill, Darlington, Bishop Stortford, and Warrington. It is, I think clear, therefore, that the competition is diffused among a satisfactory number of institutions, and that we are in no danger of failing in our efforts from the cause which brought failure to the Public Schools' Medals scheme.

The Scholarships, Prizes, and Diplomas were then handed to the students.

REPORT OF THE COUNCIL.

The Annual Report was then read by the Secretary, Mr. SEEBOHM:—

The Council have the pleasure of submitting to the Fellows the following Report on the financial and general condition of the Society:—

Members.—The number of Fellows elected during the year (ending April 30th, 1891) was 237, besides three Honorary Corresponding Members. In the previous year, 1889–90, the total elections amounted to 293, and in 1888–89 the number was 181. Our losses have been, by death 72 (besides four Honorary Corresponding Members), by resignation 32, and by removal on account of arrears of subscription 49; making a net increase for the year of 84. In the year 1889–90 there was an increase of 131; in 1888–89 a decrease of 21. The total number of Fellows on the list (exclusive of Honorary Members) on the 1st of May was 3579.

Finance.—As will be seen by the annexed Balance Sheet, the total net income for the financial year ending 31st December, 1890 (i. e. exclusive of balance in hand) was 9531*l.* 16*s.* 2*d.*, of which 7053*l.* consisted of entrance fees and subscriptions of Fellows. In the previous year, 1889, the total net income was 8224*l.* 7*s.* 7*d.*, and the amount of subscriptions, &c., 5960*l.*; in 1888 the two totals were 8053*l.* 5*s.*, and 5976*l.* respectively.

The net expenditure for the past year (i. e. exclusive of balance in hand and the purchase of Great Indian Peninsula Stock) was 8218*l.* 5*s.* 10*d.* The net expenditure in 1889 was 7025*l.* 15*s.* 10*d.*; in 1888, 7908*l.* 18*s.* 6*d.*

The Finance Committee of the Council have held, as usual, Monthly Meetings during the year, supervising the accounts of the Society. The Annual Audit was

held on the 1st of April last, the Auditors being, on behalf of the Council, Sir Rawson W. Rawson and S. W. Silver, Esq., and on behalf of the Fellows at large, E. O. Tudor, Esq., and J. Duncan Thomson, Esq. The cordial thanks of the Council and Fellows are due to these gentlemen for having freely devoted their valuable time to this important task. At the end of their labours the Auditors drew up the following Report to the Council :—

Auditors' Report.—"The undersigned, appointed to audit the Accounts of the Royal Geographical Society for the year ended 31st December, 1890, have examined the Balance Sheet submitted to them, and compared it with the books and vouchers, and have found it to be correctly stated and sufficiently vouched. Their task has been on this, as on former occasions, greatly facilitated by the satisfactory manner in which the books are kept, and the accounts presented to them by the Accountant.

"The Accounts for 1890 present in one respect an exceptional character. The Reception of Mr. H. M. Stanley by the Society in the Albert Hall, after his return from the Emin Pasha Relief Expedition, led to an usually large accession of new Fellows, and a consequent increase of revenue. The number of new Fellows in 1889 was 219; in 1890, 301; increase, 82. The difference in receipts in the two years was, in Entrance Fees, 291*l.*; Life Compositions, 630*l.* (more than double); Annual Subscriptions, 216*l.*, making in all 1137*l.*, or with 220*l.* produced by the sale to Fellows of extra Gallery Tickets for the Reception, an aggregate sum of 1357*l.* Against this has to be placed an exceptional expenditure of 573*l.*, representing the total expenses of the Stanley Meeting. The net balance in favour of the Society (exclusive of the increased future Annual Subscriptions), may be taken at 784*l.*

"On the expenditure side the following items call for notice. An increase of 195*l.* for Medals and other Awards, owing to the gift of special medals to Mr. Stanley and his companions.

"An increase of 365*l.* (from 233*l.* to 598*l.*) under the head of Scientific Purposes, includes Grants to the Universities, and two years' Grants to the Oxford University Extension for the promotion of Geographical Education, the total amount thus expended during the year for Geographical Education being 477*l.*; and lastly, an increase of 205*l.* for Maps and Illustrations, which includes 135*l.* for Maps to illustrate Professor Ramsay's work on Asia Minor.

"In comparing the Printer's Accounts it must be borne in mind that in 1889 an extra item of 363*l.* was paid for the production of a new edition of 'Hints to Travellers.'

"In 1889 a surplus of 1000*l.* was placed on deposit at the Bankers, and remains there. In 1890 the sum of 1504*l.* 14*s.* 6*d.* was invested in the purchase of 850*l.* Great Indian Peninsula Railway Stock, bearing 5 per cent. interest.

"A comparison of the last three years shows the following results :—

Years.	Ordinary Receipts.	Total Expenditure.				
	£	£				£
1888	8053	7909	Surplus	..	..	144
1889	8224	7026	Surplus	..	..	1198
1890	9532	8219	Surplus	..	..	1313

"The arrears of subscriptions, valued last year at 440*l.*, have decreased this year to 408*l.*

"The Investments remain the same as last year, with the increase above noticed of 850*l.* Indian Railway Stock. The details follow :—

<i>Source.</i>				£	s.	d.
Davis bequest	..	..	..	1800	0	0
Murchison bequest	..	..	..	1000	0	0
Gill Memorial	..	..	..	1028	5	6
Peek Grant	..	..	..	1000	0	0
Back bequest	..	..	..	561	0	8
Trevelyan bequest	..	..	..	510	4	0
Miscellaneous	..	..	..	15,519	2	2
				£21,418	12	4

<i>Nature.</i>				£	s.	d.
North-Eastern Railway 4 per Cent. Debenture Stock				1000	0	0
Great Indian Peninsula Railway 5 per Cent. Stock ..				4850	0	0
Great Western Railway 4½ per Cent. Stock (Davis bequest)				1800	0	0
London and North-Western Railway 4 per Cent. Stock (Murchison bequest)				1000	0	0
Caledonian Railway 4 per Cent. Preference Stock				2000	0	0
Norwegian 4 per Cent. Bonds				1000	0	0
New South Wales 3½ per Cent. Stock (Gill Memorial)				1028	5	6
India Stock				1000	0	0
India 3½ per Cent. Debentures				1000	0	0
Consols				3669	2	2
„ (Peek fund)				1000	0	0
„ (Back bequest)				561	0	8
„ (Trevelyan bequest)				510	4	0
On deposit				1000	0	0
				£21,418	12	4

“The estimated present value of the above Stock is 25,648*l.* 15*s.* 10*d.*

“The total Assets of the Society, estimated last year at 41,391*l.* 5*s.* 3½*d.*, have increased, according to the same calculation, to 42,018*l.* 1*s.* 1½*d.*; but if the difference between the nominal and real value of the Investments be added, they amount to 46,248*l.* 4*s.* 7½*d.*

RAWSON W. RAWSON,	} <i>Auditors.</i>
S. W. SILVER,	
J. D. THOMSON,	
E. O. TUDOR,	

April 1st, 1891.”

The following Balance Sheet and Statement, showing the Receipts and Expenditure of the Society from the year 1848 up to the present date, are annexed to the Report of the Auditors:—

No. VIII.—Aug. 1891.]

2 N

Receipts.

BALANCE SHEET FOR THE YEAR 1890.

Expenditure.

1890.	£ s. d.	£ s. d.	1890.	£ s. d.	£ s. d.
<i>Balance in Bankers' hands 31st Dec. 1889..</i>	371 11 9		<i>House:—</i>		
<i>Do. Accountant's do.</i>	11 1 2½		Taxes and Insurance..	97 3 0	
		382 12 11½	Repairs and Furniture	186 6 6	
<i>Subscriptions:—</i>			Coals, Gas, and Water	73 2 7	
Arrears.. .. .	242 0 0		Miscellaneous	118 10 1	475 2 2
For the current year..	4114 0 0		<i>Office:—</i>		
Paid in advance	656 0 0		Salaries	994 0 0	
		5012 0 0	Stationery and Printing	317 12 8	
<i>Entrance Fees .. ..</i>	.. ..	888 0 0	Miscellaneous	186 9 9	1495 2 5
<i>Life Compositions.. ..</i>	.. ..	1153 0 0	<i>Library:—</i>		
<i>Parliamentary Grant ..</i>	.. ..	500 0 0	Salaries.. .. .	335 0 0	
<i>Royal Premium .. ..</i>	.. ..	52 10 0	Purchase of Books ..	115 5 4	
<i>Rent of Shop and Vaults</i>	.. ..	140 0 0	Binding	117 6 3	
<i>Advertisements in 'Pro-</i>	153 0 0		Miscellaneous	23 15 0½	591 6 7½
<i>ceedings'</i>			<i>Map-Room:—</i>		
<i>Sale of Publications ..</i>	404 7 4	557 7 4	Salaries	450 0 0	
<i>Payments made in error, refunds, &c. .. ..</i>	.. ..	62 19 5	Purchase of Maps and Diagrams	43 7 3	
<i>Loan of Diagrams.. ..</i>	.. ..	10 16 2	Instruments and Re-	62 10 0	
<i>Payments for Scientific Instruction .. .. .</i>	.. ..	85 2 6	pairs	68 3 3	624 0 6
<i>Sale of Duplicate Library Books .. .. .</i>	.. ..	44 1 0	Miscellaneous		
<i>Sale of Tickets for the Stanley Reception ..</i>	.. ..	220 2 6	<i>Map-Drawing-room:—</i>		
			Salary	250 0 0	
<i>Dividends:—</i>			Miscellaneous	5 1 0	255 1 0
North-Eastern Railway			<i>Meetings:—</i>		
4 per Cent. Debenture Stock.. .. 1000l.	39 0 0		Evening Meetings ..	301 9 9½	
Great Indian Peninsula Railway 5 per Cent. Stock .. 4850l.	249 16 11		Stanley Meeting.. ..	351 0 3	652 10 0½
Great Western Railway 4½ per Cent. Stock [Davis bequest] 1800l.	74 11 9		<i>Medals and other awards</i>	.. ..	399 1 10
London and North-Western Railway 4 per Cent. Stock [Murchison bequest] 1000l.	39 0 0		<i>Scientific Purposes:—</i>		
Caledonian Railway 4 per Cent. Preference Stock .. 2000l.	78 0 0		Scientific Instruction..	178 10 0	
Norwegian 4 per Cent. Bonds .. 1000l.	39 0 0		Grant to Oxford and Cambridge Universities	300 0 0	
New South Wales 3½ per Cent. Stock [Gill memorial] 1028l. 5s. 6d.	35 1 10		Grant to Oxford University Extension.. ..	120 0 0	593 10 0
India Stock .. 1000l.	34 2 6		<i>Publications:—</i>		
India 3½ per Cent. Debentures .. 1000l.	34 2 8		Printing Monthly 'Pro-	936 14 6	
Consols 3669l. 2s. 2d.	98 7 8		ceedings'		
" [Peck fund] 1000l.	26 16 4		Printing 'Supplementary Papers' and Maps	250 13 9	
" [Back bequest] 561l. 0s. 8d.	15 1 0		Maps and Illustrations for 'Proceedings' ..	736 10 4	
" [Trevelyan bequest] 510l. 4s. 0d.	13 13 4		Postage of Monthly 'Proceedings'	329 0 10	
Interest on 1000l. deposited to Dec. 31st, 1890	29 3 3		Payments to Contributors, Translations, &c.	204 0 0	
		805 17 3	Editor of Publications	200 0 0	
			Miscellaneous	96 9 10	2753 9 3
			<i>Payments in error returned</i>	.. ..	21 2 0
			<i>Expeditions:—</i>		
			Grant to Asia Minor Exploration Fund ..	150 0 0	
			Grant towards the Exploration of Zim-babue Ruins	200 0 0	350 0 0
			<i>Purchase of 850l. Great Indian Peninsula Railway Stock .. .. .</i>	.. ..	1504 14 6
			<i>Balance in Bankers' hands 31st Dec. 1890</i>	175 3 5	
			<i>Do. Accountant's do.</i>	16 5 4½	191 8 9½
	£ 9914 9 14				£ 9914 9 14

REGINALD T. COCKS,
Treasurer.

Audited and found correct, 1st April, 1891.

RAWSON W. RAWSON,
S. W. SILVER,
J. D. THOMSON,
E. O. TUDOR,

Auditors.

STATEMENT showing the RECEIPTS and EXPENDITURE of the Society from the Year 1848 to the 31st Dec., 1890.

	Year.	Cash Receipts within the Year.	Cash Amounts invested in Funds.	Deducting Amounts invested in Funds; actual Expenditure.
		£ s. d.	£ s. d.	£ s. d.
¹ Includes Treasury Grant of 1000 <i>l.</i> for the East African Expedition.	1848	696 10 5	.. ..	755 6 1
	1849	778 3 0	.. ..	1,098 7 6
	1850	1,036 10 5	.. ..	877 2 10
² Includes Treasury Grant of 2500 <i>l.</i> for the East African Expedition.	1851	1,056 11 8	.. ..	906 14 7
	1852	1,220 3 4	.. ..	995 13 1
³ Includes Legacy of Mr. Benjamin Oliveira, 150 <i>l.</i> 17 <i>s.</i> 1 <i>d.</i>	1853	1,917 2 6	.. ..	1,675 6 0
	1854	2,565 7 8	.. ..	2,197 19 3
	1855	2,584 7 0	.. ..	2,636 3 1
⁴ Includes Legacy of Mr. Alfred Davis, 1800 <i>l.</i>	1856	3,372 5 1	533 10 0	2,814 8 1
	1857	3,142 13 4	378 0 0	3,480 19 9
⁵ Includes Legacy of Sir Roderick Murchison, 1000 <i>l.</i>	1858	3,089 15 1	.. ..	2,944 13 6
	1859	3,471 11 8	950 0 0	3,423 3 9
	1860	5,440 12 1	466 17 6	5,406 3 7
⁶ Includes Mr. James Young's Grant for Congo Expedition, 2000 <i>l.</i>	1861	4,792 12 9	1,358 2 6	3,074 7 4
	1862	4,659 7 9	1,329 7 6	3,095 19 4
⁷ Includes 1000 <i>l.</i> 14 <i>s.</i> 6 <i>d.</i> sale of Exchange Bill.	1863	5,256 9 3	1,837 10 0	3,655 4 0
	1864	4,977 8 6	1,796 5 0	3,647 7 10
⁸ Includes Mr. James Young's Grant for the Congo Expedition, 1041 <i>l.</i> 14 <i>s.</i>	1865	4,905 8 3	1,041 5 0	4,307 4 5
	1866	5,085 8 3	1,023 15 0	4,052 15 0
	1867	5,462 7 11	1,029 0 8	3,943 17 4
	1868	5,991 4 0	1,857 3 9	4,156 17 10
⁹ Includes Parliamentary Grant of 3000 <i>l.</i> to Cameron Expedition.	1869	5,859 16 0	2,131 5 0	4,646 0 8
	1870	5,042 6 1	3,802 6 0	3,845 10 6
	1871	5,637 3 7	1,000 0 0	3,726 4 4
¹⁰ Includes Donation of 500 <i>l.</i> by Mr. C. J. Lambert.	1872	5,119 7 9	1,999 4 6	5,871 13 2
	1873	7,761 18 10	2,015 1 8	6,697 12 6
¹¹ Includes Legacy of Admiral Sir George Back, 540 <i>l.</i>	1874	5,753 5 10	499 0 0	7,876 2 3
	1875	7,934 15 10	2,002 7 6	5,683 4 10
	1876	11,611 11 8	.. ..	6,870 13 1
¹² Includes Legacy of Sir W. C. Trevelyan, 500 <i>l.</i>	1877	107,950 1 11	2,538 2 0	8,940 17 11*
	1878	13,124 10 0	3,000 0 0	6,361 9 6
¹³ Includes 1005 <i>l.</i> 8 <i>s.</i> 2 <i>d.</i> , sale of Exchange Bill.	1879	128,979 14 10	1,551 10 10	6,990 14 2
	1880	8,589 18 4	1,567 5 1	8,454 1 10†
¹⁴ Includes 1000 <i>l.</i> received from Mr. B. Leigh Smith.	1881	8,809 19 5	.. ..	8,382 5 6†
	1882	128,942 15 0	.. ..	8,179 10 7
¹⁵ Includes 500 <i>l.</i> on loan from Bankers.	1883	129,599 9 0	1,001 5 0	8,624 2 11
	1884	128,964 11 7½	.. ..	9,266 0 5
¹⁶ Includes 99 <i>l.</i> 0 <i>s.</i> 10 <i>d.</i> , sale of India Debentures.	1885	128,738 12 3	.. ..	8,555 3 10½
	1886	17,963 9 0	1,000 0 0	7,767 18 0†
	1887	8,007 16 3	.. ..	8,483 10 3
¹⁷ Includes Donation of 1000 <i>l.</i> from Miss Gill.	1888	8,053 5 0	.. ..	7,908 18 6
	1889	8,224 7 7	1,000 0 0	7,025 15 10
	1890	9,531 16 2	On deposit. 850 0 0	8,218 5 10

* This sum includes the Special Parliamentary Grant transferred to the Cameron Expedition Fund in February 1877.

† This amount includes the payment of two sums of 500*l.* each, contributed to the African Exploration Fund in this and the previous year.

‡ This sum includes the payment of 102*l.* 8*s.* to the African Exploration Fund; also 714*l.* 9*s.* 1*d.*, the final payment for Cameron Expedition Fund.

STATEMENT OF ASSETS—31st December, 1890.

	£ s. d.
Freehold House, Fittings, and Furniture, estimated (exclusive of Map Collections and Library insured for 10,000 <i>l.</i>)	20,000 0 0
Investments (amounts of Stock), as detailed in the above Report of the Auditors valued March last at	25,648 15 10
Arrears due on December 31, 1890, £1021. Estimated at	408 0 0
Balance at Bank	£175 3 5
„ in Accountant's hands	16 5 4½
	191 8 9½
Total	£46,248 4 7½

Publications.—The monthly 'Proceedings' have been issued with regularity throughout the year; the twelve numbers for 1890 forming a volume of 806 pages, illustrated by 24 maps and 19 pictorial diagrams. The total cost of the edition of 5000 copies (including 329*l.* 0*s.* 10*d.* for free delivery to Fellows and Institutions) was 2406*l.* 5*s.* 8*d.* From this is to be deducted the amount of 557*l.* 7*s.* 4*d.* received from sale of copies to the public and from advertisements. The sum of 230*l.* 13*s.* 9*d.* was expended on 'Supplementary Papers,' of which Vol. III. Part 1, and Vol. IV. complete were issued during the year.

Library.—During the past year 900 books and pamphlets have been added to the Library; 705 by donation, and 195 by purchase; 132 pamphlets have been put in covers by the Society's map-mounter, and 370 volumes have been bound.

The sum of 127*l.* 4*s.* 9*d.* has been spent in purchasing books, and the further sum of 128*l.* in binding for the Library.

Among the more important accessions are the following:—Baillie's 'Kurrachee' (the Author); Dobson's 'Russia's Railway advance into Central Asia'; Lallemand's 'Tunis'; continuation of the 'Dictionary of National Biography'; the publications of the Meteorological Office, the Intelligence Department of the War Office, and of the Admiralty; continuation of the General Report of the Survey of India (the Director-General of the Survey), and of the publications of the Geological Survey of India (the Indian Government); a collection of Administrative and other Reports on India and Burma (the various Governments); Account of Operations of the Great Trigonometrical Survey of India, Vols. XI., XII., and XIII. (The Secretary of State for India); the publications of the International Geodetic Association; continuation of the Reports of the Norwegian North-Atlantic Expedition (the Editorial Committee); 'La Palestine Illustrée' (Prof. Paul Chaix); Stanley's 'In Darkest Africa,' 2 vols. (2 copies) (the Emin Pasha Relief Committee and the Publisher); new editions of Murray's and Baedeker's Handbooks; 'Die Balearen,' Vol. VI. (the Author); Wolff's 'Rambles in the Black Forest' (the Publishers); Sterrett, 'Epigraphical Journey in Asia Minor,' and the 'Wolfe Expedition to Asia Minor'; Hosie's 'Three Years in Western China' (the Publishers); Kinloch's 'Large Game Shooting in Thibet, &c.'; 'Le Voyage de la Terre Sainte composé par Maître Denis Possot et achevé par Messire Charles Philippe, 1532'; Thomson, 'Mungo Park' (the Publishers); Chaffanjon, 'L'Orénoque et le Caïra'; Dr. Junker's 'Reisen in Afrika,' Vols. I. and II., and English translation of Vol. I. (the Publishers); Sapeto's 'Étiopia' (the Publisher); Bourgade's 'Paraguay'; Chisholm and Leete, 'Longman's School Geography for North America' (the Publishers); a series of Illustrated Notices on the French Colonies; 'Statement exhibiting the Moral and Material Progress and Condition of India during the year 1888-9'; Oliver, 'Across the Border'; 'Mission scientifique du Cap Horn, 1882-1883,' 5 vols.; Sella and Vallino, 'Monte Rosa e Gressoney' (D. W. Freshfield, Esq.); Borelli's 'Éthiopie méridionale' (the Author); Angel's 'Geografia general . . . del Estado de Antioquia en Colombia' (the Author); Greswell's 'History of the Dominion of Canada' (Clarendon Press); Baker's 'Wild Beasts and their Ways,' 2 vols. (the Publishers); Guillemard's 'Life of Magellan' (the Publishers); Crawford, 'Round the Calendar in Portugal' (the Publishers); Hare's 'North-Eastern, South-Eastern, and South-Western France,' 3 vols. (the Publisher); Caine's 'Picturesque India' (Hon. G. N. Curzon, M.P.); Hill, 'With the Beduins' (the Publishers); Ellis, 'The Ewe-speaking Peoples of the Slave Coast of West Africa' (the Publishers); Jephson, 'Emin Pasha and the Rebellion at the Equator' (the Publishers); Troup, 'With Stanley's Rear Column'; Ward's 'Five Years among the Congo Cannibals'; Barttelot's 'Diaries'; Jameson, 'Story of the Rear Column' (Mrs. Jameson); White's 'Development of Africa' (the Publishers); Nansen's 'First Crossing of Greenland,' 2 vols. (the

Publishers); Meyer's 'Across East African Glaciers' (the Publishers); 'Appleton's Guide to Mexico'; Gooch, 'Face to Face with the Mexicans' (the Publishers); Reeves, 'The Finding of Wineland the Good'; Shield's 'Big Game of North America' (The Publishers); Lucas, 'Historical Geography of the British Colonies,' Vol. II. (the Clarendon Press); Shaler's 'Aspects of the Earth'; the Voyage of the 'Gazelle,' 5 vols.; Castillo's 'Gran Diccionario de España,' Vol. I.; Jankó, 'Das Delta des Nil' (the Author); Armentia's Narrative of his Voyage on the Beni and Madre de Dios (Señor Ballivian); Norton's 'Handbook of Florida' (the Publishers); the publications of the Hakluyt Society; Longstaff's 'Studies in Statistics' (the Author); Wagner's 'Geographisches Jahrbuch,' 1890; Yeat's 'Map Studies of the Mercantile World,' and 'Golden Gates of Trade' (the Publishers); 'Géographie de Ptolémée'; Hart's 'Flora and Fauna of Sinai'; Fotheringham's 'Adventures in Nyassaland' (the Publishers); 'Picturesque America,' 4 vols.; Nelson, 'Five Years at Panama' (the Publishers); Thouar's 'L'Amérique du Sud'; Knight's 'Cruise of the *Alert*' (the Publishers); Cevallos, 'Compendio de la Historia del Ecuador'; Chardin's 'Travels in Persia,' 2 vols.; Polak's 'Persien'; Andrada's 'Manica' (the Publisher); the publications of the United States Geological Survey and of the Smithsonian Institution, including the Bulletins of the Survey; Monographs, Vol. I., Lake Bonneville, by G. K. Gilbert; Eighth and Ninth Annual Reports of the Survey, by J. W. Powell; Sixth Annual Report of the Bureau of Ethnology to the Secretary of the Smithsonian Institution, and Annual Report of the Smithsonian Institution, 1888 (the U.S. Geological Survey and the Smithsonian Institution); continuation of the U.S. Hydrographic Office publications, and of the publications of the U.S. Naval Observatory; Barkley's 'Ride through Asia Minor' (the Publisher); Brinton, 'The American Race' (the Author); Brown's 'Genesis of the United States,' 2 vols.; Greswell's 'Geography of Canada and Newfoundland' (the Clarendon Press); Wislizenus, 'Handbuch der geographischen Ortsbestimmungen auf Reisen'; Dalrymple's 'Oriental Repertory,' 2 vols.; Grosier's 'Description of China,' 2 vols.; Lisiansky's 'Voyage round the World'; Pagès, 'Voyages autour du Monde,' 2 vols.; Parkinson's 'Voyage to the South Seas'; Guillaïn, 'Voyage à la Côte Orientale d'Afrique,' Atlas; Benndorf and Niemann, 'Reisen in Lykien und Karien'; Petersen and Von Luschán, 'Reisen in Lykien, Milyas und Kibyrtis'; Lanckoróński, 'Les Villes de la Pamphylie et de la Pisidie,' Vol. I.; and 'Der Rheinstrom,' Text and Atlas.

Scientific Purposes Grant.—During the past year 36 intending travellers have received instruction from Mr. Coles, in Practical Astronomy, in the Society's Observatory, and in route surveying with the theodolite, prismatic compass, and plane-table, in the country. There has been a marked increase in the amount of instruction given, the number of hours devoted to teaching being 511, as against 343 of the previous year.

Instruments to the value of 612*l.* 8*s.* have been lent during the past year to the following travellers:—Capt. A. F. Mockler-Ferryman (Cameroons), 51*l.* 8*s.* 6*d.*; Mr. A. P. Maudslay (Central America), 45*l.* 5*s.*; Mr. E. A. Floyer (Egypt), 35*l.*; Mr. J. Theodore Bent (Mashonaland, &c., South-east Africa), 116*l.* 16*s.* 6*d.*; Dr. D. Kerr-Cross (South-east Africa), 78*l.* 18*s.* 6*d.*; Prof. W. M. Ramsay (Asia Minor), 10*l.* 5*s.*; Lieut. B. L. Selater, R.E. (for Mr. H. H. Johnston's expedition, South-east Africa), 274*l.* 14*s.* 6*d.*

The instruments lent to the following gentlemen have been returned during the past year, with the exception of those which have been lost:—Mr. H. W. Seton-Karr (Alaska), 1890; Capt. A. F. Mockler-Ferryman (Cameroons), 1890; Rev. W. G. Lawes (New Guinea), 1880.

The following is a list of travellers who still have the instruments lent to them

in their possession :—Rev. W. P. Johnston (East Africa), 1879 ; Rev. T. Wakefield (East Africa), 1882–83 ; Mr. W. Deans Cowan (Madagascar), 1883 ; Mr. E. Douglas Archibald (for cloud observations in England), 1885 ; Dr. E. J. Baxter (East Africa), 1884–85 ; Lieut.-Col. Kitchener (East Africa), 1885 ; Mr. F. C. Selous (South Central Africa), 1888 ; Mr. H. H. Johnston (Mozambique), 1889 ; Mr. F. S. Arnot (Central Africa), 1889 ; Rev. A. Hetherwick (South-east Africa), 1889 ; Mons. H. M. P. de la Martinière (Morocco), 1889 ; Rev. H. Ridley (Malay Peninsula), 1890 ; Mr. A. P. Maudslay (Central America), 1890 ; Mr. E. A. Floyer (Egypt), 1891 ; Mr. J. Theodore Bent (Mashonaland, &c., South-east Africa), 1891 ; Dr. D. Kerr-Cross (South-east Africa), 1891 ; Lieut. B. L. Sclater, R.E. (Mr. H. H. Johnston's expedition, South-east Africa), 1891 ; Prof. W. M. Ramsay (Asia Minor), 1891.

Map Room.—The accessions to the Map Room Collection during the past year comprise 616 Maps and Charts on 936 sheets ; 25 Atlases (including continuations) containing 698 sheets of Maps, 700 Photographs, 151 Lantern Slides, and 51 Views. Of these, 30 Maps on 189 sheets, 14 Atlases, 167 Photographs, and 151 Lantern Slides have been purchased. The decrease in the number of sheets of maps received is owing to the approaching completion of the Ordnance Survey.

Among the more important donations to the Map Room Collection are :—

Maps.—98 sheets of the Ordnance Survey of the British Isles (presented by the First Commissioner of Public Works, through the Director-General of the Ordnance Survey) ; 72 British Admiralty Charts (The Lords Commissioners of the Admiralty, through the Hydrographer) ; 91 sheets of the various Indian Government Surveys (H.M. Secretary of State for India) ; 17 United States Charts (Hydrographer to the Bureau of Navigation, Washington, D.C.) ; 30 French Charts (Service Hydrographique de la Marine, Paris) ; 6 sheets of Maps of Sweden (l'Institut Royal Géologique de Suède, Stockholm) ; 4 sheets of Generalstabens topographiske Karte over Danmark (Danish Minister of War, through the Danish Legation) ; 12 sheets of Maps and Charts of Norway (Norges Geografiske Opmaalning) ; 12 Maps, on 47 sheets, of the French Possessions in Asia and Africa (l'Administration des Colonies, Magasin des Approvisionnements Coloniaux, Paris) ; Large Map of South Australia (Surveyor-General of South Australia) ; 6 Maps of Queensland (Surveyor-General of Queensland) ; Parts XXXVI. and XXXVII. of the Topographischer Atlas der Schweiz (Bureau Topographique Fédéral à Berne) ; 16 Maps published in Petermann's 'Geographische Mitteilungen' (Herr Justus Perthes) ; 4 Maps of various parts of the World published by Herr Dietrich Reimer, Berlin (the Publisher) ; 7 Maps of the United States (Messrs. Rand, McNally, & Co.) ; Ethnographical Maps of Troms and Finmark (Prof. J. A. Friis) ; Map of the Route taken by the B.S.A. Co.'s Expedition to Mashonaland, 1890 (Sir John Willoughby, Bart.) ; 4 MS. Maps of the Benué River and Tributaries (Capt. A. F. Mockler-Ferryman) ; 9 Maps of various parts of the world published by J. Bartholomew & Co. (Publishers) ; Panoramic Sketch of the Valley of Kashmir, by Abdool Raheem, a native of Bokhara (Mrs. Prestwich) ; Map of Capt. Grombchevsky's Journey in Central Asia (Major-General Venukoff) ; Model of New Zealand, by Dr. J. Hector (the Director of Royal Gardens, Kew) ; Specialkarte vom westlichen Kleinasien, Parts 1 and 2 (Dr. H. Kiepert) ; Bartholomew's Commercial Chart of the World on Mercator's Projection (Messrs. G. Philip & Son) ; Parts 1 and 2 of the Universal Atlas (Messrs. Cassell & Co.).

Photographs.—24 Photographs of the Yang-tse Gorges, taken by Mrs. Archibald Little in 1889 (Mrs. Little) ; 285 Photographs taken during the Portuguese Expedition to Muata Yamvo's Kingdom (Capt. Carvalho) ; Album of Photographs of Andorra (F. H. Deverell, Esq.) ; 171 Photographs of Central Caucasus, taken in 1890

(Signor Vittorio Sella); 7 Photographs of the Eastern Archipelago (Capt. J. F. L. Maclear, R.N.); 89 Photographs of Southern France, &c. (James Jackson, Esq., Paris); Album containing 19 Photographs of Mount Etna and neighbourhood (Prof. Emile Chaix); 44 Photographs of Kashmir and Ladak (Capt. A. F. Mockler-Ferryman); 9 Photographs of Guatemala (Edward Gledhill, Esq.); 5 Enlarged Photographs of the Caucasus (Hermann Woolley, Esq.); 12 Photographs of British Honduras (Alfred Usher, Esq.); 12 Photographs of West Africa (Dr. Freeman).

Nine new Diagrams have been constructed by the Society's draughtsman, and alterations and corrections have been made to five others; one diagram has been constructed off the premises.

The Report having been read,

The Ven. Archdeacon FARLER proposed the adoption of the Council Report. He said:—This very clear and well prepared report shows the great advancement of the Society. We must all be pleased to find so large an increase in the number of Members, and consequently in the income of the Society, and I must say the Society is to be congratulated on its sound financial position, as this is very necessary to the carrying on of its work. I am also very glad to see the increase in the grants for scientific purposes, and considering the rapid advance now being made by education in the country it is necessary that geography should not stand still. If some of our rulers knew a little more of geography, we should not hear of the extraordinary announcements sometimes made by statesmen. It is now some years ago when a Foreign Secretary said that Demerara was an island somewhere in America; since then, however, there has been a constant increase in geographical knowledge. I think it would be well if all our rulers could travel for some years, but as this is impossible, the next best thing would be for them to become members of this Society. You will also see that the investments have improved in value; this shows how carefully they have been made; the advance from 21,000*l.* to 25,000*l.* in the value of the securities proves with what care our money is being invested. I also consider we owe a deep debt of gratitude to the Council, for the valuable Report and 'Proceedings.' I therefore beg to propose that the report be adopted.

In seconding the motion, Mr. DELMAR MORGAN said:—I have much pleasure, as an old Fellow of the Society, in seconding this report. I have been a member now since 1869, and look upon the increased number of members as a very satisfactory sign of the interest which geography is everywhere awakening in the country, and I hope we may look forward to a future of great prosperity.

The Report was then adopted by the meeting.

THE BALLOT FOR THE COUNCIL 1891-92.

The Ballot for the new Council then took place, and the Scrutineers, on completing their examination of the balloting papers, announced that the list, as recommended by the Council, was unanimously adopted. The list is as follows, the names of new members, or those who change office, being printed in *italics*:—

President:—Right Hon. Sir Mountstuart Grant Duff, G.C.S.I., C.I.E., &c. *Vice-Presidents*: Sir Rutherford Alcock, K.C.B.; Major-General Sir F. J. Goldsmid, K.C.S.I., C.B.; Sir Joseph Hooker, K.C.S.I., C.B., F.R.S.; Sir John Kirk, K.C.B., G.C.M.G., F.R.S.; General R. Strachey, R.E., C.S.I., F.R.S.; General Sir C. P. Beauchamp Walker, K.C.B. *Treasurer*: Edward L. Somers Cocks, Esq. *Trustees*: Right Hon. Lord Aberdare, G.C.B., F.R.S.; Right Hon. Sir John Lubbock, Bart., F.R.S. *Secretaries*: Douglas W. Freshfield, Esq.; H. Seebohm, Esq., F.L.S. *Foreign Secretary*: Lord Arthur Russell. *Members of Council*: W. T. Blanford, Esq., F.R.S.; Right Hon. Sir Geo. F. Bowen, G.C.M.G., &c.; Hon. G. C. Brodrick; Hon. G. Curzon, M.P.;

R. N. Cust, Esq., LL.D.; Major Leonard Darwin, R.E.; Sir Alfred Dent, K.C.M.G.; The Duke of Fife, K.T.; *Francis Galton, Esq.*, F.R.S.; *Sir George D. T. Goldie*, K.C.M.G.; Sir W. Mackinnon, Bart., C.I.E.; General R. Maclagan, R.E., LL.D., F.R.S.E.; Clements R. Markham, Esq., C.B., F.R.S.; *E. Delmar Morgan, Esq.*; Cuthbert E. Peek, Esq.; *Major-General Sir Henry Rawlinson, Bart.*, G.C.B., F.R.S.; P. L. Selater, Esq., F.R.S.; S. W. Silver, Esq.; *General J. T. Walker*, R.E., C.B., F.R.S.; *Captain W. J. L. Wharton*, R.N., F.R.S.; *Colonel Sir Charles W. Wilson*, R.E., K.C.B., K.C.M.G.

THE PRESIDENT'S ADDRESS.

The PRESIDENT read his Annual Address on the Progress of Geography.* On its conclusion

Lord ABERDARE rose and said:—We owe a vote of thanks to your President for his very interesting address to-day. I know something of the difficulties of preparing an address which shall be sufficiently comprehensive without being too ponderous in detail. It is difficult indeed to deal with so many subjects, and yet deliver an address so full of life and interest as we have just heard. To those who can read within the lines, almost every paragraph of the address shows a man who has spent his life in the constant acquisition of various knowledge. Another characteristic of the address which we have just heard is its cosmopolitan spirit, which I think has always animated the Society in the past, but which has never found a more generous exponent than in Sir M. E. Grant Duff. You will observe throughout the large portion given to foreign explorers and the ample testimony he bears to their merits; this is as it should be. I should, myself, regret a year to pass without in one form or another—I do not mean simply by the address, but by honours conferred—acknowledging the worth of eminent explorers in other countries. Now having said this much, may I, as a former President, who has not of late years been able to take any part in the conduct of the Society, express my satisfaction in seeing the Council, as usual, filled with the names of men of the most varied and accurate knowledge. I think that if you survey the whole work of geography you will hardly find one department not represented by a master of that work. I have also, knowing how much depends on the manner in which the Society is served, to express my great satisfaction in seeing in the position of honorary secretary a man of Mr. Seebohm's great knowledge. Now I cannot but stand up a little for my own order. We had a very clever and amusing speech from Archdeacon Farler, in which he referred to the great progress made in the knowledge of geography, enlivening his discourse by referring to the necessity for more accurate knowledge of geography by our statesmen and governors, and I daresay this is so. I remember perfectly well a debate on the subject of the cultivation of India by means of its waters, and especially those of the Godaveri. Lord Palmerston turned round in his pleasant way to Lord Cardwell, saying, "Cardwell, where's the Godaveri?" Lord Cardwell answered, "My Lord, I beg to call to your recollection I am Secretary for the Colonies, and not for India." No doubt both Ministers knew perfectly well where it was, the question merely being put in good humour to enliven a dead debate. Well, the rev. gentleman was not perhaps aware that Demerara was for a great number of years described as an island, as I once heard an Irish M.P. describe Ireland, "an island entirely surrounded by the sea." And I am informed by a gentleman from Demerara in this room that this designation of Demerara as an

* *Ante*, p. 381.

island is still frequent. I have now to propose to you that with which I began namely, a very hearty vote of thanks to our President for his very able and instructive address.

The proposal was seconded by General R. STRACHEY.

In acknowledging the vote, which had been acceded to with applause by the meeting, the PRESIDENT said:—Ladies and Gentlemen, I beg to thank you most sincerely for the vote which I must take you to have passed, but I cannot in conscience put it to you; Lord Aberdare and General Strachey have both said very kind things about me, but none know better than those two gentlemen, who have filled the office of President, how much the President of this Society, and, I suppose, of all Societies, owes to the permanent officers. Without their most zealous assistance it would really be impossible to carry on the affairs of this great institution even tolerably; and in the preparation of the President's Address, we have always most especially to thank the vast knowledge and the extreme accuracy of our Assistant Secretary, Mr. Bates, who, himself a traveller who has most agreeably described his own travels, sinks his own individuality in assisting the President to prepare his address. I take accordingly the vote, which I suppose you have passed, as a vote of thanks, not only to the President, but to all the officers of the Society.

The meeting then terminated.

REPORT OF THE EVENING MEETINGS, SESSION 1890-1.

Thirteenth Meeting, 29th June, 1891.—The Right Hon. Sir M. E. GRANT DUFF, G.C.S.I., &c., President, in the Chair.

PRESENTATION.—*Rev. W. E. Taylor.*

ELECTIONS.—*Marmion Barrington D'Almeida, Esq.; James Blyth, Esq.; Robert Caldwell, Esq.; Rev. Thomas Havell; R. H. R. Helpman, Esq.; Charles Campbell Macklin, Esq.*

The papers read were:—

1. "The Yoruba Country, West Africa." By Alvan Millson, Esq., M.A.
2. "Journey through Gaza-land with Gungunhana's Envoys." By Denis Doyle, Esq.

After the papers and the discussion which followed, a conversazione was held in the Examination Room, where a collection of objects from the Yoruba country and photographs of the scenery and people, lent by the ex-Governor, Sir Alfred Moloney, and Mr. Alvan Millson, was exhibited. The envoys from Gungunhana, the chief of Gaza-land, were present at the meeting.

The following Report was accidentally omitted from the April No.:—

Sixth Meeting, 23rd February, 1891.—The Right Hon. Sir M. E. GRANT DUFF, G.C.S.I., &c., President, in the Chair.

ELECTIONS.—*A. J. Appleton, Esq.; Richard Benyon, Esq.; Hew Singers Bigger, Esq.; Lieut. Ralph Henry Carr-Ellison (1st Royal Dragoons); Charles Doland Crisp, Esq.; Lewis Edmunds, Esq.; Lieut. Col. Feez; Percival Fowler, Esq.; Richard Harbord, Esq.; Kay Lees, Esq.; Thomas Henry Lewinsky, Esq.; Henry Sell, Esq.; Alfred Sharpe, Esq.; Hon. Lewis Laurence Smith; Walter Charles Stewart, Esq.; Alfred Swann, Esq.; Arthur Scott Williams, Esq.; David Woodhall, Esq.*

NEW GEOGRAPHICAL PUBLICATIONS.

(By J. SCOTT KELTIE, *Librarian* R.G.S.)

ASIA.

Obrutcheff, V. A.—Geological Researches in the Highlands of the Olerma and Vitim, made in 1890. Preliminary Report. Irkutsk, 1891: 2 maps.

A systematical geological survey of this important gold-bearing region, which yields every year from 15,000 to 18,000 lbs. of gold, has been undertaken in 1890 by the Mining Administration of East Siberia. The region being but very imperfectly known and mapped as a whole, the geologist, M. Obrutcheff, to whom the survey was entrusted, evidently had to study the orography and topography of the region as well, and he came to some interesting results in that direction. It was known from a former exploration by the Olerma and Vitim expedition, that some 35 miles above its junction with the Lena, the Vitim river emerges from a gorge pierced in a massive highland, from 50 to 70 miles wide, which stretches in a general direction from south-west towards north-east. The geographer of the expedition, Kropotkin, gave it the name of Patom Highlands. It attains an average height of about 4000 feet above the sea, and consists of archaic granite and gneiss, very much folded and denudated since the remotest geological periods. It divides into several ridges, the rounded and flattened tops of which attain heights of about 5000 feet, or more, above the sea.

M. Obrutcheff has now discovered that on the western outskirts of the Patom Highlands there is a series of parallel ridges, shooting off the main highlands towards W.N.W., and attaining heights of from 3500 to 4000 feet. No less than five such ridges, all parallel to one another, may be discriminated; and they may be followed further east, thus making a series of upheavals which cross the main highlands in an almost perpendicular direction. The highest of these ridges, which includes the Vyetkin Peak (about 4500 feet), the Nakatami and the Kremnevyi Peaks (from 4200 to 4700 feet high) and several others, is traced by the author for a length of more than 70 miles, and is described by M. Obrutcheff as Kropotkin's Ridge. All these parallel ridges originated from the folding up of Lower Silurian and pre-Silurian (Cambrian?) metamorphosed half-crystalline slates, limestones, quartzites, and hard black sandstones, intersected by numerous quartz and granite dykes and veins.

It would thus appear that in North-east Siberia we meet with the same general features as have been described by M. Mushketoff in Turkistan; namely, that besides the massive upheavals stretching in a north-eastern direction, parallel to the border of the great Central and East Asian plateau, there is a series of subsequent upheavals having a nearly perpendicular direction to it (north-western or west-north-western), thus resulting in a striking uniformity of structure in the whole of the Alpine belt which fringes on the north-western border of the great plateau of Central Asia. Further research, in order to confirm and further to develop the preliminary conclusions arrived at by the East Siberian Geological Survey, thus becomes most desirable.

The author also gives numerous data to confirm and determine the limits of glaciation of the Patom Highlands, and his numerous geological observations upon the nature of the gold-bearing deposits give for the first time an insight into the connection which exists between gold-bearing strata and the glacial and post-glacial deposits.—[P. K.]

AFRICA.

Peters [Dr.] Carl.—New Light on Dark Africa: Being the Narrative of the German Emin Pasha Expedition. Translated from the German by H. W. Dulcken, PH.D. With Map and Illustrations. London, Ward, Lock & Co., 1891: 8vo., pp. xviii. and 597. Price 16s.

Dr. Peters commenced his journey into the interior in June 1889 at Kwyhoo Bay north of Patta and Lamoo. From here he marched to the Tana and along

the right bank of this river nearly to Mount Kenia, then fought his way through Masai-land, going first north and afterwards west over the plateau of Lykipia to Lake Baringo, and from there through Kavirondo and Usoga to Uganda. Here he heard that Emin Pasha had already left for the coast with Stanley, and therefore he sailed, after his negotiations with the king of Uganda were finished, down the western shore of Lake Victoria to Nyagezi in Usukuma, and returned through Iramba, Ituru, and Ugogo to the Zanzibar coast, where he arrived in July 1890. A perusal of Dr. Peters's book will show, that not Emin's relief alone, but also the extension of German territory in East Africa, and the desire to check British influence wherever he could, were the chief objects by which the leader of this expedition was prompted in all his actions. But although Dr. Peters was not successful in any of these three objects, yet his journey is of great interest in other respects. We will not discuss the difficult question how far his treatment of the natives was right; the fact remains that with a small body of men, under the most trying and adverse circumstances, he crossed countries which were very difficult to pass on account of the hostilities of the natives.

As regards geographical information, not much new light was thrown upon the countries through which Dr. Peters travelled. Up the Tana he was preceded as far as Mumoni by Mr. Piggot, then his route crossed those of Krapf and Teleki, and was in many points identical with Thomson's, whilst on the Victoria Nyanza, and south of it, his journey was the same as that of Stanley and others. But incidentally in the book a great many valuable details about the countries which he traversed and the manners and customs of the tribes whom he met with will be found. Of special interest in this respect are the ethnographical observations of the Wapokomo, Galla, Wadsagga, Masai, Wando-robbu, Wasoga, Waganda, &c.

The account of Dr. Peters's stay in Uganda is one of the most entertaining parts of the book, and the great change which has taken place in Inner Africa during the last twenty years cannot perhaps be better illustrated than by a glance at the different religious factions of Uganda. How far the suppression of the slave trade, which Mwanga promised, will be accomplished, remains to be seen; but probably Dr. Peters was too sanguine in his hopes. However that may be, he deserves the highest praise for his efforts in this direction.

Dr. Peters's remarks about an ancient intercourse of Uganda with Egypt are interesting and ingenious, but mere hypothetical speculations; they are partly erroneous, as, e.g. that Ptolemy obtained his knowledge of the Nile Lakes from the Zanzibar coast, and not from the upper Nile regions. As regards Ruwenzori and the Mountains of the Moon, his criticism is unconvincing. Dr. Peters's own theory about Unyamwezi is not new, and was introduced by various scientists, as soon as this country became known.

The illustrations and the map are good; the position of Kenia being based upon Teleki's observations.—[H. S.]

Schinz [Dr.] Hans.—Deutsch-Südwest-Afrika. Forschungs-reisen durch die deutschen Schutzgebiete Gross-nama- und Hereroland, nach dem Kunene, dem Ngami See und der Kalahari, 1884–1887. Mit einer Karte und Illustrationen. Oldenburg und Leipzig, Schulze'sche Hofbuchhandlung [1891]: 8vo., pp. xiii. and 560.

The author was a member of the expedition which the late F. A. E. Lüderitz, in 1884, sent to South-West Africa for the exploration of his newly acquired territories. Dr. Schinz first made an excursion from Angra Pequena to Keetmanshoop and back to the coast. Then he travelled north from Aus through Nama-land to Rehoboth and Windhoek, and through the Herero country via Otjizeva, Otjikango, and Otjimbingue to Omaruru. From there he proceeded to the Etosa Pan and to Olukonda and Omandongo in Ambo-land, and crossed the Kunene river near Okumbi, in September 1885. Having returned to Omandongo, the author went south-east to Grootfontein, the settlement of the Trekboers in Upingtonia. From this place he started east for Lake Ngami via Omuramba, Karakofis, and Lewisfontein. In May 1886 he arrived at Moremi's residence not far from Lake Ngami, but unfortunately he

did not reach the latter on account of illness and the refusal of Moremi to provide guides and boats. He returned to the Herero country by way of Tunobis and Gobabis, travelled once more to the Boers in Grootfontein, and arrived, October 1886, at Otjimbingue, where his explorations terminated.

Dr. Schinz's book is by far the most important publication that has appeared since the Germans took possession of this part of South-West Africa, which in many respects is still very imperfectly explored; and his wanderings through the Nama and Herero countries are not less interesting than his visits to the Cunene and the neighbourhood of Lake Ngami. The author has given particular attention to the ethnographical problems of South-West Africa, and the chapters devoted to the results of his careful studies of the different native nationalities form the most valuable portion of the book. The Hottentots are divided into Nama and Koranna, and in opposition to the views of Bleek, Lepsius, Hahn, and others, Dr. Schinz is of opinion that the Hottentots were originally a bastard race between the San and an extinct race of a light colour. The Ovaherero (or Damara) do not differ much from the other Bantu tribes of South Africa, and are divided into different groups in accordance with an old and peculiar social institution called "omaanda," a sort of family division, found also in the Ovambo, Uumbangala, and other Bantu tribes. The Ovambo who live north of the former are likewise a Bantu tribe, whose origin is unknown. Concerning them Dr. Schinz differs in various particulars from Hahn and Duparquet, and mentions eleven different subdivisions of the Ovambo, living between 26° and 16° S. lat. The Hill-Damara, the Paria of South-West Africa, who are a totally different race from the Ovaherero, as well as from the Hottentots and Bushmen, remind Dr. Schinz in certain respects of Negro tribes living much farther north, near the Binue. As regards the Bushmen of the Kalahari desert, he comes to the conclusion that their asserted equality of origin with the equatorial Inner African dwarf tribes is not yet sufficiently proved, and he especially thinks the expression "Batwa"—which is applied to both—must not be considered as conclusive. Probably before the immigration of the Bantu tribes, the Hill-Damara were the original population of the mountainous districts of the Herero and Nama countries, whilst the Bushmen inhabited the southern, eastern, and central parts of South Africa.

The author being a botanist, the book contains full and accurate descriptions of the peculiar flora of the "hinterland" as well as of the desert and sandy regions along the coast. Moreover, some data are collected about the geological and meteorological character of the country.

Interesting are the author's observations on the state of German colonial enterprise in South-West Africa. Lüderitz's undertaking, as is well known, was a complete failure, and the gold-mines which are supposed to exist in the Herero country, have not yet been discovered. A colonisation based on agriculture and cattle-rearing—for which many parts of German South-West Africa are well adapted—could be successful only if the demand in the country itself were sufficiently high, and this at present is not the case, but would become so as soon as the mining operations were successful.

Dr. Schinz highly praises the missionaries for their successful work among the natives.

The illustrations are good and the map is carefully drawn, especially as regards the country between the Orange river and Omaruru; the book will be read with interest by all who are familiar with the explorations of Galton, Andersson, Hahn, Baines, and others.—[H. S.]

Wissmann, Hermann [von].—*Meine zweite Durchquerung Aequatorial-Afrikas vom Congo zum Zambesi während der Jahre 1886 und 1887. Mit Illustrationen und 3 Karten.* Frankfurt a. O., Trowitzsch und Sohn [1891]: 8vo., pp. viii. and 261.

The author made this, his second, journey across Africa in the service of the Congo State, and started from Kwamouth (March 22nd, 1886) travelling through the countries of the Bakutu, Bashilange, and Baeuba to Nyangwe and Kassongo, and thence to the Tanganika. Owing to war having broken out in Tabora, and to the ill-feeling that existed between the Arabs and the

Germans, he found it impossible to proceed due east to the Zanzibar coast, and therefore sailed to the south of the Tanganika, and went via Stephenson road to Lake Nyassa, reaching Quilimane on August 8th, 1887.

The object of this journey was to strengthen the authority of the Congo State in the Baluba and Bashilange countries, to report upon the progress of the Arabs and the state of the slave trade, and to prevent as far as possible a continuance of the raids. Luluaburg, one of the best and most firmly established stations of the Congo State, was made the centre of the further opening up of the middle portion of the Congo State, south of the Congo. All the natives around Luluaburg were friendly disposed and in perfect obedience to the Congo State authorities. The Baluba are the most important tribe of this part of Equatorial Africa, and reach from the Kassai to the Lualaba, and even beyond. Wissmann also passed through some of the dwarf districts, and made very interesting observations in connection with these "Batwa," whose language is quite different from the Bantu languages. He describes them as very similar to others found farther north, and to measure 1.40-1.45 m. in height. Cannibalism is common among many tribes, even the faithful Bashilange having formerly been addicted to it. The author gives a lengthy account of the horrors of the Arab slave trade, which he so graphically described in his address to the Royal Geographical Society after his return from this journey. Everywhere large tracts of land were devastated, villages burnt, the country deserted, and the most abominable cruelties inflicted on the unfortunate victims. He met Said, one of the most unprincipled agents of Tibbu Tib, and Wissmann was for some time detained by the Arabs as a sort of hostage at Nyangwe and Kassongo, in case Tibboo Tib should be called to account in Zanzibar for the destruction of Stanley Falls station. This, however, was not the case. The Arabs were exceedingly bitter against the Germans on the East Coast, and against the sultan of Zanzibar as well, because he had ceded certain districts to them.

Not much new geographical information was obtained during this journey, the western part offering hardly anything fresh in this respect, as the author's route was the same as on his previous journeys. The Lukuga, which was stagnant in 1876 when Stanley saw it, and which Wissmann in 1882 found a broad and rapid river, was still a considerable stream (although the lake is subsiding) carrying off from the Tanganika more water than is supplied to this lake by the Malagarazi and all the other rivers together. Of the Stephenson road he found very little left, but he thinks that there would be little difficulty in constructing a railway line between the Tanganika and Nyassa, because the country is generally level, except in the neighbourhood of the lakes. He thinks that on the existing maps the Tanganika and Nyassa are placed too close together, and is of opinion that the Nyassa should have a more easterly position. The Scottish missionary station at Blantyre, and Mandala, the station of the African Lakes Company, are described by Wissmann as the best and finest European settlements he ever saw in any part of Inner Africa.

The volume further contains a report of the late Dr. Wolf's exploration of the Sankuru in 1886. The three maps accompanying the book are well drawn, especially that of the country between Luluaburg and Nyangwe. [H. S.]

GENERAL.

Markham, [Captain] Albert Hastings.—Life of Sir John Franklin, and the North-West Passage. London, Philip & Son, 1891: 8vo., pp. x. and 324. Price 4s. 6d. [Presented by the Publishers.]

This is a new volume of the "World's Great Explorers" Series. Captain Markham has taken some trouble to obtain fresh information on some points connected with Franklin's early life, and several of the illustrations are original. He continues briefly the study of arctic exploration in the regions in which Franklin did his work down to the present day. There are a number of maps by Mr. Ravenstein, one showing the progress of Arctic discovery. Captain Markham has had necessarily to treat much of his subject with great brevity; owing no doubt to this he has unwittingly not rendered full justice to some explorers. On p. 199 he states that Dease and Simpson explored the south

coast of Wollaston or Victoria Land. Dr. Rae was in reality the explorer of Wollaston Land. He explored it on foot in 1851, and later in the same year he further explored Victoria Land by boat, adding to the 156 geographical miles of its coast-line explored in 1839 by Dease and Simpson, at least an equal extent to the southward and eastward. In like manner the small map illustrative of the progress of Arctic discovery, facing p. 192, erroneously carries the blue colour over a part of Dr. Rae's discoveries in 1846-7, i.e. round the bottom of the Gulf of Boothia, and up its eastern spurs, almost to Hecla and Fury Strait.

NEW MAPS.

(By J. COLES, *Map Curator*, R.G.S.)

EUROPE.

Deutschen Reiches.—Karte des —. Scale 1:100,000 or 1·3 geographical miles to an inch. Sheets 326, Milowslaw; 397, Lüben; 421, Löwenberg, herausgegeben von der Kartogr. Abtheilung der Königl. Preuss. Landes-Aufnahme, 1891. Sheet 393, Kamenz, herausgegeben vom topogr. Bureau des Königl. Sächs. Generalstabes, 1880. Ausgabe 1891. Price 1s. 6d. each sheet. (*Dulau.*)

Harz.—Neueste Special-Karte vom —, von O. v. Bomsdorff. Scale 1:100,000 or 1·3 geographical miles to an inch. Magdeburg, A. Rathke. 4 sheets. Price 3s. (*Dulau.*)

Niederlanden.—Kaart van het Koninkr. —, von Dr. J. Dornseiffen. Scale 1:425,000 or 5·8 geographical miles to an inch. Amsterdam, Seyffardt. Price 2s. (*Dulau.*)

Oesterreichisch-ungarischen Reiches.—Orts- und Strassenkarte des —, von Jos. Ritter von Scheda. Scale 1:1,000,000 or 13·6 geographical miles to an inch. Artaria & Co., Wien. 4 sheets. Price 12s. (*Dulau.*)

Ostalpen.—Uebersichtskarte der —, von L. Ravenstein. Scale 1:500,000 or 6·8 geographical miles to an inch. Herausgegeben vom deutschen und oesterreichischen Alpenverein. Frankfurt a/M, L. Ravenstein. Price 2s. 6d. (*Dulau.*)

Sachsen.—Topographische Karte der Königreich —. Herausgegeben durch das Königlich Finanzministerium. Bearbeitet im topograph. Bureau des Königlich Generalstabes. Scale 1:25,000 or 2·9 inches to a geographical mile. Dresden. Sheets 47 Lommatzsch, 63 Rosswein, 129 Zöblitz, 142 Plauen. (*Dulau.*)

Schweiz.—Relief-Reisekarte der —, von R. Leuzinger. Scale 1:530,000 or 7·2 geographical miles to an inch. Bern, Schmid, Francke & Co. Price 2s. (*Dulau.*)

Westrussische Grenzländer.—Scale 1:3,000,000 or 41·6 geographical miles to an inch. Weimarer Hand- und Reisekarten aller Länder der Erde, Redigirt von J. J. Kettler. No. 91. Weimar, geograph. Institut. Price 1s. (*Dulau.*)

Zante.—Original-karte der Insel —. Auf Grund der Englischen Seekarte und der Beobachtungen des Prof. Dr. J. Partsch, entworfen und gezeichnet von Dr. Karl Peucker. Scale 1:1,000,000 or 13·6 geographical miles to an inch. Petermann's 'Geographische Mittheilungen,' Jahrgang 1891, Tafel 12. Gotha, Justus Perthes. (*Dulau.*)

ORDNANCE SURVEY MAPS.

Publications issued since the 15th June, 1891.

1-inch—General Maps:—

ENGLAND AND WALES: New Series. Sheet No. 201 (outline), 1s.
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25-inch—Parish Maps:—

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(Stanford, Agent.)

AFRICA AND MADAGASCAR.

Diégo-Suarez (Madagascar).—Carte en 16 feuilles à l'échelle du 1 : 20,000 (or 3·6 inches to a geographical mile) du territoire de Diégo-Suarez (Partie Nord de l'île de Madagascar), exécutée par les officiers d'Infanterie de Marine en 1887–1888, sous la direction de Mr. Badens, Lieutenant-Colonel, Commandant Supérieur des Troupes. (Dulaud.)

This map appears to be the result of an accurate survey. The relief of the country is shown by contours at every fifty metres, which, being printed in brown, give a pleasing effect to the map. As the map is drawn on so large a scale, and with such evident care, it is a valuable addition to our knowledge of the geography of this part of Madagascar.

ATLASES.

Historical Atlas.—The Half-Crown —. W. & A. K. Johnston, Edinburgh and London, 1891.

The present edition of this little atlas contains 35 clearly drawn maps, those of Turkey in Europe, Afghanistan, South Africa, Egypt and Abyssinia, being new. Some useful historical notes are given, with the dates of all important events in the history of England, from the Roman period to the present day, as well as the dates of all those in the history of Scotland, from the Roman period to the union of the Crowns.

The atlas is also furnished with a copious index.

Percy, Algernon Heber.—Tide Charts of the English and Bristol Channels and Entrance of the Thames, compiled from the Admiralty Tide Tables by Algernon Heber Percy, late Lieutenant Royal Navy. London, published by J. D. Potter. Price 5s.

This atlas contains a set of charts of the English and Bristol Channels, and the Entrance to the Thames, on which the information contained in the Admiralty Tide Tables has been laid down. They are arranged to show the state of the tide at different hours after, and before, high water at Dover. The direction of the tide, and its maximum velocity in knots per hour, are shown by arrows and figures, while the numbers under the names of places indicate the hour of high water at full and change. In addition to the above, numerous notes containing useful information are given.

Saint-Martin, M. Vivien de.—Atlas Universel de Géographie, construit d'après les sources originales et les documents les plus récents, cartes, voyages, mémoires, travaux géodésiques, &c. Avec un Texte Analytique. Ouvrage commencé par M. Vivien de Saint-Martin et continué par Fr. Schrader. 84 Cartes gravées sur cuivre sous la direction de MM. E. Collin et Delaune. Paris, Librairie Hachette et C^{ie}. 1891. Sheets, 65, Amérique Septentrionale. 81, Amérique du Sud, Feuille Sud. Price 2s. each. (*Dulau*.)

It is now more than twelve months since the publication of Part IX. of this atlas, which has already been twelve years in course of publication. In the present instance a new system has been adopted, and the maps are now issued separately instead of being published in parts containing three maps, as has formerly been the case. Sheet 65 is a map of North America, which has been compiled from the published portions of the same atlas or those in course of preparation. The system of colouring adopted to distinguish the different European Colonies is utterly confusing; for instance, Venezuela by this system is represented as both a French and a Russian colony, and Haiti as belonging to Portugal. Again, on Sheet 31 the whole of the Argentine Republic is clearly represented as belonging to the Netherlands.

Stieler's Hand-Atlas.—Neue Lieferungs-Ausgabe von ——. 95 Karten in Kupferdruck und Handkolorit, herausgegeben von Prof. Dr. Herm. Berghaus, Carl Vogel und Herm. Habenicht. Erscheint in 32 Lieferungen (jede mit 3 Karten, die letzte mit 2 Karten und Titel), Einunddreissigste (31) Lieferung. Inhalt: Nr. 4, Weltkarte in Halbkugeln, von R. Lüddecke. Nr. 22, Italien, Übersicht in 1:3,700,000, von H. Habenicht. Nr. 57, Klein-Asien in 1:3,700,000 von H. Habenicht. Gotha, Justus Perthes, 1891. Price 1s. 6d. (*Dulau*.)

This part of the atlas contains, as usual, three sheets of maps. The first is the world in hemispheres, orographically coloured, and others exhibiting the greatest extent of land and water. The second is a general map of Italy, with inset plans of Mount Etna, Naples and its environs, and Rome and the surrounding country. The remaining sheet is an excellent map of Asia Minor, on which all salt, or periodical lakes, are distinguished by a shade of colour, and inset plans on an enlarged scale of Smyrna, Mosul, and the Plain of Troy are given.

Universal Atlas.—The —, complete in 28 parts, including Index. Published by Cassell & Co., Limited, London, for the Atlas Publishing Company, Limited. Part 4. Price 1s. each part.

The present issue of this atlas contains four sheets of maps, viz. N.W. France; N.E. France; Würtemberg and Bavaria; United States Western, and United States North-Eastern. In addition to the principal maps, a plan of Paris and its environs is given.

PHOTOGRAPHS.

Japan.—Four Photographs of —, taken by W. Shepperson, Esq., in 1884, and presented by him to the Royal Geographical Society.

Three of these photographs, which were taken by Mr. Shepperson a few miles from Tokio, represent historical pictures much thought of by the Japanese, and serve well to illustrate their knowledge of gardening, as the dresses are composed of the chrysanthemum in its natural growth. The fourth photograph is a picture of the summit of the crater of Fujiyama.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.





PROCEEDINGS
OF THE
ROYAL GEOGRAPHICAL SOCIETY
AND MONTHLY RECORD OF GEOGRAPHY.

Ptolemy's Topography of Eastern Equatorial Africa.

By HENRY SCHLICHTER, F.R.G.S.

(Read at the Evening Meeting, March 9th, 1891.)

Maps, p. 576.

It is a well-known fact that African exploration during the last hundred years has done more for the opening up of Central Africa than was accomplished in the whole of the preceding two thousand years; but though the knowledge acquired during this long period was indeed limited and incomplete, this is no reason why we should ignore or even underestimate the results of ancient African exploration.

When, after the death of Alexander the Great, Egypt came into the hands of the Ptolemies, this dynasty understood better than any of the other successors of Alexander how to combine Greek civilisation with the customs, religion, and character of the people over whom they ruled. During the reign of the first Ptolemæan kings their capital, Alexandria, speedily rose to such a position of importance among the cities of the world that it was rivalled only by Rome, Athens, and Carthage, and by its splendid natural position and the efforts of the first Ptolemæan kings, it soon became the great centre of commerce between Europe, Asia, and Africa. Immense wealth from all parts of the then known world was collected in Alexandria, and thousands of vessels from this central port crossed the Mediterranean in all directions, and made their way to the comparatively remote ports of Western Europe. Moreover, trade routes to the tribes in the interior were opened, and towns and emporia founded on the coasts of the Red Sea, in order to direct the commerce of India, Arabia, and East Africa to Lower Egypt. But these highly enterprising kings of Egypt were not satisfied by a mere commercial success, and already the first of them, Ptolemy Soter, had commenced that world-famed library which made this town the centre of Hellenistic philosophy and science. With the greatest care, and often at enormous cost, the second of the Ptolemies collected books and

manuscripts from all parts of the world, and his successors were equally assiduous in increasing the library, so that the numbers of philosophers attracted thereby to live in Alexandria might add to the fame of the city.

From the very first geography took a leading position among the various branches of science which were cultivated in this great centre of learning. I need only mention the name of Eratosthenes, the greatest geographer in the earlier days of Alexandria, who for many years held the important post of director of the Alexandrian library; and we have proof enough that amongst the many thousands of books and manuscripts which had been collected there, geographical works, itineraries, &c., formed an important section of the library.

After Egypt had become a province of the Roman Empire, the scientific and commercial importance of Alexandria in no way decreased, and geography especially made further progress. New routes were opened to the far and unknown countries in the south and east. Equatorial East Africa became first known; expeditions were sent up the Nile beyond Meroe; Greek scientists carefully studied the countries, people, and natural history of the Upper Nile regions; and enterprising traders starting from the Red Sea, explored Abyssinia. It was at this time that the navigator Hippalus made the great discovery that it was possible to sail to India right across the Indian Ocean, favoured by the monsoon, starting either from Arabia or from East Africa; for up to this time sea communication with India consisted only in tedious journeys along the Asiatic coasts.

It was under such favourable conditions that Claudius Ptolemy began his studies at Alexandria, in the beginning of the second century of the Christian era. His great geographical work is one of the few productions in this branch of knowledge which survived the neglect and ruin of the dark ages, and it is one which had a great influence on the further development of the science. Ptolemy was the highest geographical authority through the centuries of the middle ages up to the discovery of America. Subsequently, many of his statements having proved incorrect, a reaction took place, which in many points has certainly gone too far, for in spite of his many errors, he gives much valuable information, and certain parts of his work are doubtless of high importance for our knowledge of ancient geography. Our most recent authorities, Bunbury, Nordenskjöld, Mueller, Berlioux, and others, who have closely studied his work, have acknowledged this and done him justice. And this is what I will endeavour to do with regard to an important section of his geography, on which recent explorations have thrown much light, enabling us, as I think, to verify some of his statements and to explain his mistakes and errors.

One of the most interesting parts of Ptolemy's Geography is that dealing with the coast and the interior of Eastern Equatorial Africa. Many ingenious explanations have been offered and volumes have been

written on the subject; but it must not be forgotten that African geography of the present day is in many points very different from what it was in the time of Gosselin, Vincent, Cooley, Guillaïn, and many other writers who have formerly discussed it. As regards the interior, the discovery of the lakes Victoria and Albert, and of the mountains of Kilima-njaro and Kenia, first gave indications that Ptolemy's Mountains of the Moon and Lake sources of the Nile might perhaps be really genuine and substantial geographical facts,* but a glance at Ptolemy's positions of these places made geographers shake their heads, because, even if we assumed that Mounts Kilima-njaro and Kenia and Lake Victoria fairly represented the eastern part of the Ptolemæan Equatorial East Africa, yet the western portion of it, comprising the western end of the Mountains of the Moon and another Nile lake south of the confluence of the rivers, was left entirely unexplained.

It was only by Mr. Stanley's last wonderful journey that the branch of the Nile south of Lake Albert, and Ruwenzori, the great western snow-capped mountain, were discovered, thus furnishing us for the first time, tolerably complete material for judging of the correctness of Ptolemy's information. Mr. Stanley determined the actual extent of the Albert Edward Lake and of the Semliki river; and it will be shown that he had a perfect right to claim a connection between his discoveries and the Ptolemæan mountains and rivers. Whatever the different views about the correctness of Ptolemy may be—and these views differ vastly—one thing is conspicuous, viz. that in spite of all his errors a certain similarity exists between his statements and our modern geography of Eastern Equatorial Africa, and the question is, whether this is merely an accidental similarity, or whether it is based upon some genuine foundation. Of course there are geographers who at the very outset affirm that Ptolemy did not know anything of the interior of these equatorial regions; but even these do not deny that he must have had a fair knowledge of the coast-line of East Africa, even south of the equator. Admitting this, I think it not altogether uninteresting to attempt an explanation of Ptolemy's statements, and to ascertain, if possible, whether they are in accordance with the modern geography of East Africa.

In the first place we have to consider whether Ptolemy was in a position to know anything of the interior of Equatorial East Africa. His geography, as is well known, is not at all detailed in this respect, and gives only a limited number of localities. But it has at times been a wide-spread opinion that he knew nothing at all of the interior, and was acquainted only with places on the coast. This is only a deduction from the more general assumption, that there existed no trade with the interior at all until the year 1830 or 1840, when the Arabs from the coast undertook journeys into the interior, and the trade thus established

* See Bunbury, 'History of Ancient Geography,' 1879, vol. ii. pp. 612-617.

soon spread over the vast territory to the great lakes, along routes afterwards followed up by European explorers. It is assumed that before this time trade was done only in coast products. But this assumption is incorrect, for there is distinct evidence that trading with the interior existed for a long time previously. Allusions to this trade are found in the old writers of the 16th and 17th centuries, De Barros, Pigafetta, Marmol, and others, some at least of whose statements have been found correct by acknowledged authorities of the present century. For example, it is stated that the river Quilimanse* (the mouth of which is at Melinda) was known by the Arabs as far as a thirty days' journey into the interior, and that formerly negro caravans, bringing gold to the coast, travelled from the interior to the banks of this river.† A Portuguese, named Fonseca, explored the same river for a five days' journey from its mouth,‡ and the territory of Melinda is stated to have extended at one time up the river Chimanche to a lake called Calice, situated 100 miles in the interior.§ Slave traders are reported to have brought their victims at the beginning of the present century from a distance of 1000 to 1200 miles inland to the coast.|| In the interior there lived a peaceful trading nation, which from the most remote times has been in regular communication with the coast, trading in gold, silver, copper, ivory, and slaves.¶ Their country lay west of Mombasa, and extended westward as far as the lakes of the Nile. Their name is given as "Niemiemayes,"** as "Mohenemugi,"†† and as "Moene-moezi,"‡‡ and is identical with the well-known Wanyamwezi of to-day.§§ It is further stated that these tribes were in constant trade connection with their western neighbours the Anziko or Anzikoko ||| who are placed by d'Anville in the middle of Africa near the equator. Further evidence of an early trading with the interior is shown by the articles of commerce mentioned. Nowhere on the eastern coast has gold or copper been found, and there is no doubt that they were brought from the interior to the coast, and that trade was carried on in these metals prior to and at the time of the Portuguese.¶¶ I will make a few brief remarks about ivory afterwards. I may add that it is established

* De Barros, 'Asia,' ed. Lisboa, 1552, fol. i. Dec. i.

† Compare Marmol, 'Africa,' French ed. Paris, 1667, vol. iii. p. 144.

‡ Marmol, *eodem loco*, p. 145.

§ See Pigafetta in 'Purchas' Pilgrims, London, 1625, vol. ii. fol. 1024.

|| Ritter, 'Erdkunde,' Africa, 1817, p. 121; and Geogr. Ephem., 1810.

¶ Ritter, *eodem loco*, p. 122.

** Dapper in Ehrmann's edition of Lobo, vol. ii. p. 55.

†† Pigafetta in 'Purchas' Pilgrims, vol. ii. fol. 1025.

‡‡ M'Queen, 'On Africa,' in the J.R.G.S., 1850, p. 144.

§§ Compare also Cooley, 'Geography of Nyassi,' in the J.R.G.S., 1845, who mentions the name of "Monemugi," p. 187; and Roscher, 'Ptolemæus und die Handelsstrassen in Central Africa,' 1857, pp. 97, 98.

||| "Anziki," see Cooley, *eodem loco*, p. 187.

¶¶ Ritter, 'Erdkunde,' Africa, p. 122. †

beyond doubt that another trade route existed from the coasts of the Somali country far to the west and south-west of the interior, even as far as the neighbourhood of the mountain of Komri or the Mountains of the Moon. Many inhabitants of this part of the interior of Africa sent their own caravans down to the coast in order to exchange gold and ivory for the goods supplied by the Indian merchants. The Arab writer Ebn Haukal,* in the middle of the tenth century, knew of this trade, and this shows that a regular commerce has been going on for the last thousand years between parts of the east coast of Africa and the far interior.†

Let us now go back to Greek and Roman times. Our sources of information are limited, and we have chiefly two geographical works to consult, viz. that of Ptolemy, and the *Periplus of the Erythræan Sea*, by an unknown writer. The question at what time the *Periplus* was written, whether in the first or in the second century of the Christian era, does not concern us much, because in either case both Ptolemy and the *Periplus* establish the fact that a flourishing trade existed in those times on the east coast of Africa between the natives and the Greek and other merchants. The furthestmost emporia which are mentioned in both works, are those of Azania, and especially a place called Rhapta.‡ Ptolemy, in a way which he acknowledges to be unsatisfactory to himself, tries to find the geographical latitude of these places,§ but the *Periplus* says that Rhapta was in the neighbourhood of the island of Menouthias or Menouthesias;|| and almost all authors agree that this island is Zanzibar, or one of the neighbouring islands.¶

Now the *Periplus*, referring to the trade of Azania, says that ivory was the chief article of export at all the trading places on the coast, and that it was procured in the greatest abundance. The merchants of Mouza, in Arabia, employed in this ivory trade a great many ships of heavy burden, and the whole passage from the *Periplus* (c. 16) shows that this trade was going on continuously in the described way. Pliny ¶ also refers to the large quantities of ivory procured from this part of Africa. The question is, was it possible that such a large amount of ivory as was concerned in this trade could be procured from the coast alone without a continuous trading connection with the interior? Whoever knows anything about elephants and ivory must unhesitatingly say that it was absolutely impossible. Doubtless many elephants were found near the coast in those days, and we have information that even in the beginning of the seventeenth century the elephant was found in

* 'Oriental Geography,' translated by W. Ouseley, 1800, pp. 22-23.

† Compare also Lord Valentia's Travels, vol. ii. pp. 375-378, and Ritter, 'Erdkunde,' 2nd edit. 1822, vol. i. pp. 161-166.

‡ Ptolemy, bk. iv. chap. 7; *Periplus*, chaps. xvi., xvii.

§ Ptolemy, bk. i. chaps. ix., x.

|| *Periplus*, c. 15.

¶ Hist. Nat., bk. viii. chaps. x., xi.

large numbers there.* But it must not be forgotten that only the teeth of the male animals yield a large quantity of ivory, and that shyness and precaution are the chief characteristics of the wild elephants,† and this, together with the slow propagation of the animals, makes it impossible that much ivory could be procured from such a limited area as the coast alone. Moreover, we know from the *Periplus* that at the southern ports of the Red Sea all ivory was procured from far in the interior,‡ and there is not the slightest reason why the same should not have been the case at the Zanzibar coast.

All these statements favour the conclusion that a regular ivory trade was carried on between the interior of Africa and the east coast, not only during the middle ages, but also during the first centuries of the Christian era, and therefore that the interior cannot have been entirely unknown to the Europeans trading with East Africa in those times.

As I have often to refer to the information which Ptolemy possessed of Eastern Equatorial Africa, I have given at the end of this paper a full translation of this part of Ptolemy's work, in which I have, however, omitted all repetitions and statements without scientific value.

With regard to the position of the Nile lakes, we have first to deal with the fact that Marinus of Tyre (Ptolemy's predecessor) thought the lakes were situated on the coast (bk. i. chaps. 9, 15). Ptolemy has been charged by Cooley § with inaccuracy in saying, in one place, that the Nile lakes are on the coast, and in another place that they are far in the interior; and that Ptolemy derived his knowledge of the sources of the Nile exclusively from Marinus. This is a superficial and inaccurate statement, as Ptolemy only gives the former opinion as the view of Marinus and Diogenes, and evidently with intention avoids mentioning the Nile lakes as being on the coast.¶ Contrary to this view of Marinus, Ptolemy has placed his Nile lakes in the interior; and the important passage in which he states whence he derives this knowledge is contained in bk. i. chap. 17 of his *Geography*. Whatever we may think of this passage as a whole, one thing is certain, viz. that the merchants possessed information that the Nile lakes were far in the interior. Ptolemy calls this distinctly an investigation, and I think no one has a right to say that his statement was a mere fabrication made up on the eastern coast of Africa without any knowledge of the interior of the country, either by the natives themselves or by the Arab or Greek traders who were numerous on the coast.¶ Moreover, Ptolemy states

* Vide Lobo, 'Voyage to Abyssinia,' Engl. ed., London, 1735, p. 9.

† Brehm, Thierl., 1865, vol. ii. p. 692.

‡ *Periplus*, c. 4.

§ 'Ptolemy and the Nile,' 1854, pp. 75, 55.

¶ See Müller's edit. of Ptolemy, 1883, p. 23, No. 3.

¶ As far as my knowledge goes only Berlioux ('*Doctrina Ptolemæi ab injuria recentiorum vindicata*,' Paris, 1874, pp. 26, 27) has pointed out the importance of this passage of the first book of Ptolemy, saying that this is a proof how carefully Ptolemy collected his materials.

(bk. iv. chap. 7) that the country of Azania is not on the coast itself, but more inland; and if we compare this statement with the previous one (bk. i. chap. 17), we find that some of the merchants from whom Ptolemy had his information made journeys to Azania, and therefore not only to the coast but actually into the interior of Eastern Equatorial Africa. The name "Barbaria," which the merchants applied in a more general sense (bk. i. chap. 17), is distinctly limited to the coast by Ptolemy himself (bk. iv. chap. 7).

I venture, therefore, to draw the conclusion that there was in Ptolemy's time considerable intercourse between the east coast of Equatorial Africa and the interior of the continent, and I do not think I am wrong in saying that the ivory trade was the chief foundation for such intercourse.

A few words are necessary on the way in which Ptolemy constructed his so-called "maps." It is well known that Ptolemy's geography is chiefly an extensive catalogue of positions or *loci*, the geographical latitudes and longitudes being given. As a rule, no astronomical observations formed the bases of these positions, but Ptolemy's practice was first to make a map in the way I shall afterwards describe, and subsequently to determine the co-ordinates of the points from this map. Ptolemy's statements, therefore, in most cases, serve only to guide one in the reconstruction of his original map. In the second and third chapters of his first Book he explains how to collect geographical facts and how to make use of them in the construction of maps. It appears that most of his knowledge, especially of the more remote countries of the earth, was derived from land and sea itineraries.* With these itineraries he could sometimes connect astronomical observations of geographical latitudes made by travellers or navigators who measured the altitude of stars or the shadow of the gnomon. What sort of land or sea itineraries he had before him we can see from the first Book, as well as from the *Periplus* of the Erythræan Sea. Greek merchants, Phœnician and Arab traders, and others brought all sorts of information about the trading routes,† no doubt mixed with much that was erroneous, but we see Ptolemy carefully criticising their statements (bk. i. chaps. 8, 9, 10, and 17), and earnestly striving to select those portions of the different accounts which he considered to be most reliable. If, however, his map contained many errors, even in parts which are not far from Alexandria, we must not underrate the difficulties connected with a science in its

* Berlioux (*Doct. Ptol.*, p. 25) shows that the knowledge of East Africa possessed by Marinus as well as by Ptolemy, was based mostly upon itineraries.

† Ptolemy doubtless used the facts collected by Marinus, but it is entirely wrong to assume that his geography has the character of a Phœnician rather than of a Greek science. Regarding this important point, see Heeren, *De Fontibus Ptol. in Com. Soc. Gott.*, vol. vi., 1823; Mannert, *Geogr. d. Griech. und Römer*, vol. i. p. 162; Schoening, *Welthist.*, vol. xxxi. p. 148; Gatterer, *Univ. Hist.*, p. 835; Malte-Brun, *Biogr. Univ. "Ptolémée"*; Forbiger, *Alte Geogr.*, 1842, vol. i. p. 411.

early stages, and try to discover the origin of his errors in order to eliminate them, if possible. It is my object to attempt this with that portion of his geography which deals with Eastern Equatorial Africa.

The question is still an open one among geographers, in what way Ptolemy obtained his catalogue of geographical positions, as he himself does not state how he proceeded in this respect.* At the end of the first Book Ptolemy describes two methods of projections, and it is generally assumed that he used one of these, probably the better one; combined the itineraries and astronomically obtained latitudes, as skillfully as he could, and thus constructed his original maps, copies of which we are supposed to have now before us in the well-known twenty-seven sheets accompanying his work.† But no critical investigations favour such an assumption. Firstly, the two projections described differ considerably the one from the other. He could use only one of these for his original map, and had he done so, he would certainly not have omitted to explain, that only with this method could his original map be reconstructed with perfect accuracy.‡ Secondly, Ptolemy describes his projections as methods which give similar results to spherical positions, and reference is made in several places to a spherical map or globe with which the projections are compared, as regards their greater or less exactitude. Thirdly, he severely condemned the projection which his predecessor Marinus used (bk. i. chap. 20), and therefore it is only to be expected that his own maps would be drawn on the more correct projections which he himself recommended. But in twenty-six of the twenty-seven Ptolemæan maps, as we have them now before us, the incorrect projection of Marinus is used, and only one of them, viz. the general map of the world, is drawn according to one of the Ptolemæan projections. Nordenskjöld, who recently published a collection of old

* All authors agree that Ptolemy must have had the help of a globe or map, when he worked out the text of his geography; see Forbiger, 'Handbuch der alten Geographie,' 1842, vol. i. p. 411; Ukert, 'Marinus und Ptolemæus,' Rhein. Mus. Phil., vi. 1839; Bunbury, 'Ancient Geography,' 1879, vol. ii. p. 578; Nordenskjöld, 'Fac-simile Atlas of the Early History of Cartography,' 1889, p. 8. But it would be wrong to conclude that the maps existing at present are the original ones of Ptolemy, because, as Bunbury correctly says, the tables enable any one to construct such maps for himself.

† Agathodæmon of Alexandria, of whom nothing else is known, is stated in some of the best manuscript codices to have drawn the existing maps of Ptolemy. Because of the great inconsistencies of these maps with Ptolemy's text, it is however very doubtful that Agathodæmon produced these maps in Ptolemy's time, and under his supervision, as Heeren, *De Font. Ptol., Com. Soc. Gott.*, vol. vi. 1823, suggests. Much more probable is the assumption that he lived several centuries after Ptolemy; see Nordenskjöld, 'Fac-simile Atlas,' 1889, p. 8. The maps of Agathodæmon are sometimes at variance with Ptolemy's text, but I will not deny that they may be more correct in some instances. As regards Eastern Equatorial Africa, however, this is by no means the case. For instance, the different large tributaries which according to Agathodæmon flow into the Nile Lakes, are perfectly arbitrary, geographically incorrect, and are not to be found in Ptolemy. This arbitrary treatment of Ptolemy's topography of the upper Nile has given rise to many errors.

‡ See Roscher, 'Ptolemæus,' p. 10.

Ptolemaean maps, remarks that this inconsistency of Ptolemy seems to have astonished his publishers in the fifteenth and sixteenth centuries.* Fourthly, Ptolemy's general map of the world is drawn, as we have seen, on one of his own projections. But it is another surprising inconsistency that he should have used the more inaccurate method of projection, as is actually the case, whilst he distinctly states that he prefers the other one which, though more difficult, is much more accurate (see bk. i. chap. 24). From all these reasons it is very unlikely that Ptolemy originally constructed a map on one of these two projections. But in the first Book of his Geography (chap. 22) he describes the method of designing a map on a sphere or globe. This description is so minute and detailed that it is evident that he actually made such a spherical map himself, and did not merely recommend it as a variety. It will be objected that this must have been a large globe, but this is to judge him by a modern standard, where the art of projections, and the detailed knowledge of the surface of our planet, based upon astronomical observations, are so complete that nobody would take the wholly unnecessary trouble of constructing a large spherical map for scientific purposes. Moreover, Ptolemy was in the first place an astronomer, and the use of the globe was therefore quite familiar to him, and I think I am not wrong in asserting that only an expert in astronomy could have conceived the idea of treating geography similarly to astronomy, by marking the co-ordinates of terrestrial places in the same way as the co-ordinates of the stars. And, indeed, this is clearly shown in the above-mentioned chapter (i. 22) of Ptolemy, where he describes his method of drawing on the sphere "like the positions of stars are marked on a solid sphere." After that it is further evident that he described the different methods of projection for the purpose of enabling any one, into whose hands his book might fall, to construct in an easy way maps, more or less similar to his own correct spherical one, as he was well aware of the difficulty, or practical impossibility for many people, of constructing maps on the sphere, as globes of large dimensions are of course necessary for any degree of accuracy. It follows from this that it is not quite correct to speak of Ptolemy's "original map," he having originally constructed a terrestrial globe. The greatest error which he made in the construction of this globe is, that the geographical degree which he used was too small, he reckoning it at 500 stadia, whilst it is in reality 600. Therefore Ptolemy's degree is only five-sixths of the true one, and wherever he used itineraries or other direct measurements of distances for the construction of his globe, the number of degrees has to be reduced by one-sixth. This is of vital importance for the countries with which I have to deal. Mannert† has clearly shown, that the whole of that part of Ptolemy's globe which lies south of Egypt, is, owing to this error,

* Nordenskjöld, 'Fac-simile Atlas of the early History of Cartography,' 1889, p. 6.

† 'Geographie der Griechen und Römer,' 3rd edit, 1829, vol. i. pp. 141-142.

in part drawn too small, and in part unnaturally extended. Ptolemy had to work with fixed distances which he derived (as we have seen) from the itineraries of navigators and land travellers, and all these he converted into degrees of latitude of 500 stadia each, and then put them down on his globe, and in this way all places on the coast were laid down in wrong positions. The same error that, as Mannert says, occurred in coast places, Ptolemy made in the interior of East Africa. Another correction has to be made depending on the nature of the regions to which the itineraries refer. I have made but one correction of this kind, in an itinerary which, according to our modern maps, if laid down in a straight line, would cut Lake Victoria to a large extent; this correction consisting in making it curved in accordance with the necessarily curved march around its shore.

Having given the reasons which lead to the conclusion that there must have been in early times a trade connection between the coast and the interior of Eastern Equatorial Africa, and explained the method which Ptolemy used in the construction of his terrestrial globe, we have now to examine the geographical facts given by him. The statements which he makes are not numerous, but there is, I think, one of two alternatives left us, viz. either that he did not know much, or that he endeavoured to select critically what he thought to be worth mentioning. Those writers who, like Cooley,* speak of the "corruption" of ancient geography in Ptolemy's times, dispute the critical sense of the man who was doubtless one of the greatest astronomers as well as geographers of his time. They refer depreciatingly to his numerous errors, which no modern geographer can be blind to, but they forget that he was, in spite of his errors, the first who introduced mathematical accuracy into geography; and if we carefully study his text, especially his first Book, we can but be agreeably surprised at the critical sense and judgment which he exhibited under the most difficult circumstances. If the information which he gives is called meagre, we must not forget that, being an astronomer rather than a descriptive geographer, he gave his information in systematically-arranged tables,† and not in exhaustive descriptions, like the *Periplus* of the Erythræan Sea, and the works of Strabo, Pliny, and others; and provided his statements are found to be correct, then his geographical knowledge of East Africa is superior to that of most geographers prior

* 'Ptolemy and the Nile,' 1854.

† Bunbury ('Ancient Geography,' vol. ii. pp. 612-615), considers it unfortunate that Ptolemy's work is a mere catalogue, and gives little or no explanation of his sources of information. He correctly says that new and unexpected light is thrown upon the sources of the Nile, and takes it for certain that by the extensive trade of the Greeks with Rhapta, opposite Zanzibar, naturally new sources of information about the interior were obtained, and that there is no reason to doubt that authentic intelligence of the great lakes in the equatorial regions of Africa had reached the ears of the Greek traders at Rhapta, and was communicated by them to Ptolemy.

to the discoveries of recent times. I think that in this part of his geography he carefully selected such facts as he thought reliable, and that he did not state mere vague rumours about lakes, mountains, rivers, &c. Had he been inclined to do this, he would certainly have been able to fill his "maps" just as full as the geographers of the middle ages did theirs; but rather than descend to such an act, he openly confesses where his knowledge is incomplete, or where it altogether fails.

I shall now try to reconstruct mathematically the principal points of Ptolemy's topography of Equatorial East Africa, viz. the different hitherto more or less uncertain points on the coast, and in the interior the two Nile lakes, the confluence of the rivers flowing therefrom, and the hypothetical Mountains of the Moon.

The first local error which renders Ptolemy's statements about East Africa inaccurate, in addition to the already described general errors, is the absolutely uncertain geographical latitude. He himself freely admits and explains this uncertainty (bk. i. chaps. 9, 10), saying that he had no exact basis for fixing the latitude for the most remote southern localities. This is another proof that he did not intend to state to his readers as truth what he himself considered as mere hypothesis. Secondly, as his information was mostly based on itineraries at a time when no compass was used in this part of the world, and the directions could only be roughly ascertained by the sun and the stars, we must not expect that the relative positions of the points to each other are correct in this respect (see bk. i. chap. 8). But in making their itineraries, experience, and the calculation of the time taken to reach places where food and water could be obtained, must have enabled the traders to give the distances between the different points of their routes with tolerable correctness; by this means, in fact, reliable information has often been gained, especially in African geography, even in quite recent times. In dealing with the topography our *modus operandi* is as follows:—

1. To look for the basis on the coast which Ptolemy used in order to fix the position of this starting-point; and to eliminate his error of geographical latitude.

2. To reduce the positions of his points to modern graduation.

3. But in all other respects to leave the distances from the basis of the map intact, with the exception of the above-named itinerary round the western side of Victoria Nyanza.

After making these simple rectifications we shall be able to inquire whether Ptolemy's positions coincide with the corresponding places of our modern maps. I think we shall find that this is the case.

The first thing is therefore to find the above-named basis of the Ptolemæan map of this part of Africa, and it is evident that this must be the particular site on the east coast to which most of the trade routes from the interior converge. Fortunately Ptolemy and the Periplus both indicate this region with perfect accuracy. The centre of all trade in

Eastern Equatorial Africa was the district of Rhapta.* Ptolemy, as we have seen, gives besides the capital which is called Rhapta, a promontory called Rhaptum, and a river called Rhaptus. It is difficult to ascertain with perfect exactitude the position of the "Metropolis of Rhapta," because this place was not on the coast itself, but farther inland, but almost all authorities agree that the river Rhaptus can be no other than the Pangani of our modern maps, and the promontory of Rhaptum one of the two capes south of Zanzibar, viz. Puna Point and Ras Mamba Mku. My calculations show that Ras Mamba Mku† is in perfect harmony with all the points as given by Ptolemy, and I therefore came to the conclusion that this is the central point of the region of Rhapta as described by Ptolemy, and therefore the basis for the explanation of the Ptolemæan map of Eastern Equatorial Africa. I have then reconstructed on a map the original positions of Ptolemy in Equatorial East Africa, and, as far as I know, such a map is not published at the present time in any reliable form. Most of the maps which are found in the old editions, published by Mercator, Bertius, and recently by Nordenskjöld, are based on Agathodæmon's arbitrary treatment of Ptolemy, and are useless for proper calculations and measurements. Roscher's map ('Ptolemæus,' 1857) is in many points much better, but it contains, especially in East Africa, gross errors which must lead to confusion.‡ I have carefully tried to avoid all possible errors, and therefore used for the construction of the map only the best existing editions of Ptolemy, viz. that of Wilberg and Müller, so that I think the calculations and reductions afterwards given are perfectly reliable. I have then drawn another map of modern Equatorial East Africa, with the same scale of the degree, and introduced the Ptolemæan positions into this, after having them reduced as above described.

Contrary to my wishes I am obliged to introduce a new method of measuring and comparing distances, on account of the above-mentioned reduction to modern graduation. So I have expressed the measurements of the distances on the two maps in millimeters, and reduced those obtained from the ancient map always by one-sixth. It might be said that I could have avoided this by enlarging the modern, or by reducing the ancient map by one-sixth, which would at once give the required distances. But it is practically impossible to do this, as such a geometrical reduction would not give even approximately that degree of accuracy obtained by the arithmetical method which I have em-

* Ptolemy, bk. i. chaps. 9, 17; iv. 7; Periplus, 16.

† Berlioux (Doctr. Ptol., p. 13) from other reasons comes to the same conclusion, whilst Müller (Ptol., p. 48) takes Ras Puna, which is a little north of Ras Mamba Mku, to be the promontory of Rhaptum.

‡ For instance, he places Maste mons 5° north, instead of south latitude; has the confluence of the rivers which form the Nile, 1° south, instead of 2° north of the equator; and gives an incorrect position of the promontory of Rhaptum.

ployed. Besides, it has the great advantage that in each instance an easy and perfect control can be had over the results obtained, which would be quite impossible, had I made the reduction geometrically. Upon these grounds I hope to be excused for the introduction of the millimeter scale as a standard measure for the following calculations.

A glance at the two maps shows that almost all the points of Ptolemy marked there, and the knowledge of which he derived directly from East Africa, coincide with corresponding positions of our modern maps.

I have now to prove this in detail. The distance from the promontory of Rhaptum to the mouth of the river Rhaptus is on the old map 17.5 mm. This reduced by $\frac{1}{2}$ gives 14.6 mm. If a circle is drawn with this radius and with the promontory of Rhaptum as a centre, it cuts the coast exactly at the mouth of the river Pangani or Rufu, which, owing to the descriptions of Ptolemy and of the *Periplus*, is the Rhaptus of antiquity.* Rhapta metropolis, as we have seen, was not on the coast, but inland, and it is impossible to fix its exact locality, as no ruins exist of it at the present day. The next place mentioned by Ptolemy on the coast to the north of the Rhapta territory is the trading station of Tonike, which on the old map is 37 mm. distant from the promontory of Rhaptum. This reduced gives 30.8 mm., and the circle described cuts the mouth of the Mangudo river in the neighbourhood of the two places which are called to-day Kilefi and Tagaungu. If I placed much importance on the etymological comparison and explanation of names, as several writers, especially Cooley, were accustomed to do, I might, perhaps, point out that the names Tagaungu and Tonike have the same origin, and the river names Rufu and Rhaptus similarly. Berlioux† tried to explain that "Ramo" in the word Usaramo comes from the same root as Rhapta, but I do not see any scientific reasons for the correctness of these assumptions. As important as names are, when their identity is established beyond doubt, so dangerous is it to deal with etymological similarities in a too confident manner; and they should be given only as additional proofs and geographical explanations never based chiefly upon them. Numerous errors which have originated herefrom, especially in African geography, in our days as well as in the times of Edrisi and Leo Africanus, might be cited.

Ptolemy gives a place on the coast north-east of Tonike, named Essina, which is distant on his map from the promontory of Rhaptum 42.7 mm. This distance reduced gives 35.6 mm., and a circle with this radius and the promontory of Rhaptum as centre goes through the well-known town and trading place of Melinda, at the mouth of the Sabaki river. The next place mentioned is Sarapion or Serapion with a distance

* See Berlioux, 'Doctrina Ptolemæi,' p. 12; and Roscher, *Ptolemæus*, p. 94.

† Doctr. Ptol., p. 14.

of 47 mm. from the promontory of Rhaptum, equal to 39·2 mm. reduced. The circle goes through the mouth of the Tana river in the Formosa Bay. Ptolemy somewhat confuses the names Essina and Sarapion. We have seen that in the passage of the first book (chap. 17) the names are exchanged, and Essina placed inside the bay which can be no other than Formosa Bay, and in the table of positions in the fourth book, Sarapion and Essina are out of order as regards their respective positions, so that we must probably exchange the names. As, however, this is of subordinate importance, I have put down the names in accordance with the figures in the table.

Looking at all these last-named places, we see that all the important rivers and modern trading places of this part of the East African coast coincide with the positions given by Ptolemy. This is in itself good evidence of the correctness of our calculations, but we derive further and conclusive proofs by comparing Ptolemy's positions with the descriptions in the *Periplus*. That work says (c. 15),—

. . . In due order succeed the dromoi (or courses) of Azania, the one going by the name of Sarapion and the other by that of Nikon [Tonike of Ptolemy]. Proceeding thence you pass the mouths of numerous rivers and a succession of other roadsteads, lying apart from one another a day's distance either by sea or by land. There are seven of them altogether, and they reach on to the Puralaoi Islands and the narrow strait called the channel, beyond which, where the coast changes its direction from south-west slightly more to south, you are conducted by a voyage of two days and two nights to Menouthias, an island stretching towards sunset, and distant from the mainland about 300 stadia.*

Now, in the first place, all authorities agree that the Menouthias of the *Periplus* can only be one of the three islands Pemba, Zanzibar, or Mafia. D'Anville† takes it for certain that it is Zanzibar; Vincent‡ leaves it undecided, whether Zanzibar or Mafia is the island in question, but says there is no doubt that it must be one of the two; Guillain§ says that all three islands, Pemba, Zanzibar, and Mafia, can with the same right be taken for the Menouthias of the *Periplus*, but that he considers Zanzibar the most probable one; and Vivien de Saint Martin|| considers Pemba the most likely of the three islands. Comparing the reasons and conclusions of all these and other well-acknowledged authorities, and forming my own opinion from the description in the *Periplus*, I think that only Zanzibar can be the island in question. But as this is a matter of explaining the *Periplus* rather than Ptolemy, it is beyond the limits of this paper to deal with it at length, and I hope to treat of this in another publication.

* See M'Crindle's edition of the *Periplus*, 1879, pp. 66-69.

† 'Géographie ancienne,' ed. par Manne, 1834, vol. ii. p. 648.

‡ 'The *Periplus* of the Erythraean Sea,' 1800-1805, vol. i. p. 157.

§ 'Documents sur l'histoire de l'Afrique orientale,' 1856, vol. i. pp. 111, 113.

|| 'Histoire de la Géographie,' 1873, p. 190; and 'Le Nord d'Afrique dans l'antiquité,' p. 307.

Ptolemy does not say anything about the country between Tonike and the river Rhaptus, whilst we have learnt from the *Periplus* that to the south of Tonike the coast has numerous rivers (the *Periplus* says there are seven of them) and roadsteads not far from one another. Now Tonike has been placed by d'Anville * on the Somali coast, north of the second degree of south latitude; Vincent † assumes that it is somewhere between Melinda and Magdishu; Berlioux ‡ places it north of Mombasa; Vivien de Saint Martin § north of Lamu; M'Crindle || at Torre, between Marka and Barawa; and Guillain ¶ between Magdishu and Marka; but Guillain candidly adds, "ces explications sont aussi hypothétiques que la signification des mots auxquels elles se rapportent, est incertaine."** All this is more or less guesswork, derived from the totally erroneous assumption of d'Anville that the country called Azania is identical with the coast of Ajan, merely on account of the similarity of the names.†† This is the reason why all the just-mentioned assumptions about the locality of Tonike are far too much north, but not only that, in striking contrast with the description of the country found in the *Periplus*. The rivers to be found on the coast in the neighbourhood of Magdishu, Marka, Torre, or Barawa, are not numerous, and the course of the Webi makes it impossible that a great number ever existed here, even if 1700 years ago that coast were better watered than at present. The authors who, like Berlioux and Vincent, try to place these localities in closer proximity to Melinda and Mombasa, bring them nearer to their actual position; but even then it is impossible to find the mouths of seven rivers and the corresponding roadsteads which are distant from each other by one day's journey, either by sea or by land (see the above-cited passage of the *Periplus*).

But my calculations, comparing the ancient with the modern map, not only exactly fit on the mouths of the chief rivers of this part of Africa, viz. the Pangani, Mangudo, Sabaki, and Tana, but there is also no difficulty in determining the seven rivers and roadsteads south of Takaungu of which the most important one is situated at Mombasa, and the larger ones of the others being called Umba and Zigi.

Ptolemy does not mention the islands which, as we have learnt from the *Periplus*, lie between Tonike and Rhapta in close proximity to the coast, and a lively discussion has been maintained between numerous authors about the position of these Puralaoi Islands of the *Periplus*, without any definite decision being arrived at. This question also is beyond the limits of this paper, but according to the *Periplus* they can have no other position than between Mombasa and Zanzibar, all other islands being much too far north to be reached from Zanzibar by

* Géogr. anc., vol. ii. p. 646.

† Doctr. Ptol., p. 18.

‡ Periplus, p. 68.

** Documents, p. 108.

† Periplus, vol. i. pp. 135-136.

§ 'Le Nord d'Afrique,' p. 308.

¶ Documents, vol. i. p. 103.

†† See d'Anville, Géogr. anc., vol. ii. p. 645.

an average sailing time of two days and two nights. I think it most likely that the islands Wazin and Sii are the representatives of the ancient Puralaoi Islands, and this is also in harmony with the fact mentioned in the *Periplus* (chap. 15) that there the coast changes its direction slightly more to the south.

Considering all that has been stated here, I am of opinion that the position of Tonike, and of the country south of this place, is correctly determined, as well by my calculations deducted from Ptolemy, as by the descriptions of the *Periplus*; and it seems to me that this is a proof of the accuracy of the method of calculation on the one hand, and of the coincidence and reliability of Ptolemy and the *Periplus*.

The next place of Ptolemy is called *Magnum Littus* (the Great Strand), which has on the old map a distance from the promontory of Rhaptum of 59·3, and on the reduced of 49·4 mm. The circle cuts the coast-line north of the islands of Patta and Lamu, where the coast for a considerable distance is quite open, having no bay or harbour of importance. *Parvum Littus* (the Little Strand) is the next following place, distant from the promontory of Rhaptum 74·7 or reduced 62·3 mm. A circle with this radius intersects the coast-line south of the river Jub, at a place where the coast is quite similar to *Magnum Littus*. The similarity of the coast development explains the similarity of the names, and in fact this whole coast is one long continuation, interrupted only by the mouth of the Sheri river, and there is no doubt that this interruption alone gave rise to the distinction of *Parvum* and *Magnum Littus*. According to the name, the northern part of this coast-line, viz. from the mouth of the Sheri to that of the Jub, is considerably shorter than that from the Tana to the Sheri.

Then follows a place called *Austri cornu* by Ptolemy. Its distance from the promontory of Rhaptum is 94·4, or reduced 78·7 mm., and the circle cuts the coast a little south of the well-known town of Barawa. The next place is *Apocopa*, distant from the promontory of Rhaptum 110, or reduced 91·7 mm. This circle goes through Marka, another very important place on the coast. The distinction of little and great *Apocopa*, which the *Periplus* makes, is not found in Ptolemy, whilst the next places of Ptolemy's description are omitted in the *Periplus*. After *Apocopa* comes *Phalangis*, distant from Rhaptum 117·5, or reduced 97·9 mm. The circle goes through *Magdishu*, which, as is well known, is one of the largest towns of the east coast of Africa. A mountain with three peaks, as described here by Ptolemy, has not been ascertained yet on any point of the East African coast; but not far from this place the steep coast is described as consisting of black rocks, which might, perhaps, have shown the described mark to ancient navigators. The next is the promontory of *Zingis*, at a distance of 122, or reduced 101·7 mm. from Rhaptum. The circle intersects the coast at the promontory of *Warsheik*, *Warsheik* being likewise an important and

old trading place of the coast. Ptolemy states, as we have seen, that in the neighbourhood of the last-named place the country of Azania begins, and here indeed the coast changes its character.

The next in order is called Opone, a name which is found in Ptolemy as well as in the *Periplus*. It is distant from the promontory of Rhaptum 127·5, or reduced 106·3 mm., and the circle intersects the coast in the neighbourhood of a locality which is marked in the maps some distance north of Warsheik as the hills of Muret. Then follows Panum vicus, at a distance of 137·5, or reduced of 114·6 mm., for which no modern place of any importance can be found at this part of the coast. It is, however, stated that it was situated in a bay not far from Aromata, and this corresponds with the place where the Doara meets the sea.

The last of all the places on this coast which we have to consider is the promontory and emporium of Aromata, often mentioned by the geographers of antiquity. In the ancient map it is distant from the promontory of Rhaptum 150, or reduced 125 mm., and our circle passes through that part of the coast which is marked on the modern maps as Ras Asuad (the black head or promontory). Here we must stop, as Ptolemy's coast-line makes a sudden turn to the north-west, and therefore no more direct measurements, in the hitherto described way, with the Rhapta territory as a centre, can be correct. Judging only from most of the maps which illustrate Ptolemy's Geography, and which are usually drawn in a careless and more or less incorrect way, it is a widespread opinion that Ptolemy's promontory of Aromata is identical with Cape Guardafui. But that this is entirely erroneous has been shown long ago. Almost a century past Gosselin proved that Ptolemy had in his map erroneously put down the northern coast of Somaliland as belonging to the Red Sea, inside the Straits of Bab el Mandeb,* and by this is fully and well explained the surprising and wholly erroneous width of the southern parts of the Red Sea in Ptolemy's description. Therefore Ptolemy's promontory of Aromata cannot possibly be the Cape Guardafui of to-day, but the latter coincides with the place which Ptolemy erroneously puts down as Dire or Dere, as is proved by Gosselin. And, indeed, I find the distance between Aromata and Dire in a straight line to be 87 mm., which gives reduced 72·5 mm., whilst the distance from Ras Asuad (Aromata, as we have found) to Cape Guardafui is 70 mm., which is a good proof that Gosselin's view is correct.

Also the other geographers of antiquity who know Cape Aromata did not regard it as the point where the coast of Africa begins to incline towards the south. In the *Periplus* (c. 12, M'Crindle's edition, p. 59) it is said before Aromata is reached (journeying from Egypt), that the coast inclines southward. Pliny† says that, according to Juba's infor-

* See Gosselin, 'Recherches sur les connaissances géographiques des anciens dans le golfe arabique,' in his work *Géogr. d. anc.*, vol. ii. pp. 75-278.

† *Hist. nat.*, bk. vi. chap. 34.

mation, the Atlantic, i. e. the Indian Ocean, begins at the promontory of Mosylum. Strabo does not know Aromata at all,* as his knowledge of Eastern Equatorial Africa is much more limited than that of Ptolemy and the Periplus.†

Two further conclusive proofs that Cape Aromata must be placed much more to the south than Cape Guardafui, are given by Ptolemy and by the Periplus. Ptolemy, independently of his tables, says in the 14th chapter of the first book of his Geography that the position of Cape Aromata is $4^{\circ} 15' N.$ lat.; and the Periplus (c. 30), which is absolutely reliable in this respect, contains the very important statement that the island of Dioscorides (Socotra) is nearer to Suagros (Cape Fartak) on the Arabian coast than to Aromata. But Socotra lies much nearer to Cape Guardafui than to any point of the Arabian coast, and already M'Crindle (Periplus, 1879, p. 92) has pointed out that the distance from Socotra to Cape Fartak is nearly double the distance from this island to Cape Guardafui. Therefore it is impossible that Aromata and Cape Guardafui are identical. I may add that according to another passage of the Periplus (c. 57) Aromata became after the before-mentioned discovery of Hippalus one of the starting-points for the journey to India across the Indian Ocean by means of the monsoon, and this explains the importance of Aromata in antiquity much better than the incorrect geographical assumption of identifying it with Cape Guardafui.

But even in the seventeenth century, when Ptolemy was often copied in the most senseless way, I found in a rare little book of the well-known Bertius ‡ a map on which, with a certain amount of discriminating knowledge, Cape Aromata was put south of Guardafui.§

I attach special importance to having proved this position of Cape Aromata, because it is the last point of Ptolemy's coast-line to which I can apply my described method of calculation. The correct position of the Rhapta territory was easily proved, as we have seen, by the coinciding and independent statements of Ptolemy and the Periplus; and

* Geogr., xvi. c. 4, § 14.

† Strabo, who derives his knowledge from Artemidorus, proceeds from mons Elephas to the harbour of Psygmus, then to the so-called watering-place of the Kynokephali, then to Notu keras, the last promontory on this coast. Here the knowledge of Artemidorus is at end, and he only says, that if we turn from here to the south, we have no more descriptions of harbours and places, because nothing is known of the coast beyond this point.

‡ 'Geographia vetus,' 1645, p. 16.

§ Gosselin (Géogr. des anciens, vol. i. pp. 183-184) gives the distance from Aromata to Rhapta as 7500 stadia = $12\frac{1}{2}^{\circ}$ ($1^{\circ}=600$ stadia), and considers this much too short for the distance from Cape Guardafui to Zanzibar; but we find it correct if Ras Asuad is taken as Aromata. Müller's correction for the distance between Panum and Opone (see footnote) does not make any difference in this respect. But we cannot attach much importance to the arbitrary explanation of distances of such sailing itineraries: compare Vincent, Periplus, vol. i. pp. 135-136, who gives 14,800 stadia for the same distance as Gosselin, i. e. almost twice as much.

having now fixed Cape Aromata, which forms the northern limit of Ptolemy's coast-line of Eastern Equatorial Africa, it is a good proof that the intermediate places are also correctly determined. I may be allowed to repeat that this correct position of Cape Aromata has been ascertained, not only by my method of calculation, but also by the above given indisputable facts which are quite independent of it, and this forms the best possible proof of the correctness of the mathematical method which I apply in my explanation of Ptolemy.

We have thus determined by measurement all the points given by Ptolemy, on the east coast of Equatorial Africa, north of the promontory of Rhaptum * and it has been shown that they coincide with the geographical facts known in antiquity, as well as with our modern maps. It is quite natural that many of the trading places of to-day, which are situated on favourable points of the coast, existed in ancient times, and it will have been noticed that this coincidence could be proved in many cases, e. g. Mombasa, Melinda, Tana river, Marka, Magdishu, Warsheik, and others with perfect accuracy and without any difficulty. I think that this speaks equally for the careful treatment of the subject in Ptolemy, and for the correctness of the method applied. The region round Rhapta and Menouthias was the centre of the whole trade of Eastern Equatorial Africa in those times, and it is quite natural that with these places as centres Ptolemy calculated the distances and designed the map of East Africa on his terrestrial globe, as he, the greatest astronomer of his time, was accustomed to do with the distances of stars on the celestial globe.†

But it is well known that still more important geographical features than these on the coast are indicated by Ptolemy, in the interior of Eastern Equatorial Africa, viz. his two Nile lakes, the course of the river Nile, and the celebrated Mountains of the Moon. Let us try whether our method of calculation and measurements is also applicable to these. It must not be forgotten what I have already explained, that the geographical latitudes of the points, as given by Ptolemy, cannot possibly be correct.

The distance from the promontory of Rhaptum to the Eastern Nile Lake of Ptolemy, is on the ancient map 78.0 mm. This reduced by $\frac{1}{6}$ gives 65 mm. distance. A circle with this radius cuts the south-eastern shore of Lake Victoria in close proximity to the well-known place of Kagehyi. Trading caravans from the coast must at all times have reached the lake in the neighbourhood of this place, as modern explorers,

* Ptolemy gives only one point on the coast south of Rhaptum, viz. the promontory of Prasum which is probably in the neighbourhood of Mozambique. As, however, its latitude is ascertained only by analogy from Meroë (Ptolemy, bk. i. chap. 10), its position cannot be determined with exactitude. The nearest place on our modern maps is Cape Melano or Melamo, north of Mozambique.

† Ptolemy, bk. i. chap. 22.

guided by natives, have done in our days. Itineraries from the coast to the lake most probably gave Ptolemy an opportunity for calculating the proper distance of the lake from the starting-point of the caravans on the coast, as was done in our century long before Speke first saw the shores of the Victoria Nyanza. It is well known that the itineraries which intelligent native traders such as Lief ben Saeid,* and others have given, have been found perfectly correct as regards distance,† and I think it is a reasonable question why the same should not have been the case in ancient times. As regards Lake Tanganika, I will not deny that Ptolemy might have had knowledge of it, but it must have been as difficult for him as for the first Europeans who heard of these lakes in modern times, to distinguish them separately,‡ yet it is not difficult to understand that the shortest and most important route to the lakes was that from the coast to the shores of the Victoria Nyanza. A statement of the above-mentioned native trader, Lief ben Saeid, must be mentioned here. He reported that it is well known by all the people living at the lake, that the river which goes through Egypt takes its source and origin from the lake.§ Probably, only traders can be meant possessing this knowledge, but we hear from Lief ben Saeid that the lake was at his time the great centre of trade of Inner Africa, and so, most probably, it has been at all times.|| His last journey from Zanzibar to the Victoria Nyanza was made in 1831, and this, therefore, shows also the incorrectness of the opinion mentioned above, that there was no trade going on at that time between the interior and the coast.

We have now to consider the distance from the promontory of Rhaptum to the eastern end of the Mountains of the Moon. This on the ancient map is equal to 71·0 mm. Eliminating the error of the degree gives a distance of 59·2 mm., and the circle with this radius goes a little south of the position of Mount Kenia, which, as we have seen

* M'Queen, *Journal R.G.S.*, 1845, pp. 371-374.

† Compare Schirren, 'Nyandscha,' 1856, pp. 4-7; M'Queen, *Journal R.G.S.*, 1850, p. 245; Krapf, 'Reisen in Ostafrika,' 1858, vol. ii. pp. 507-516; Beke, *Journal R.G.S.*, 1847, p. 47.

‡ Compare Krapf, 'Reisen in Ostafrika,' vol. ii. p. 515.

§ The hypothetical Lake Kura which was very often mentioned in early times, was supposed to be in the centre of Africa, and according to Abdulfeda was 1000 miles long. The Nile of Egypt was said to issue from its north-eastern angle (compare the information received by Lief ben Saeid). The shores of the lake are inhabited by the Demdem, Demadem, or Dumadum (see Ritter, 'Erdkunde,' 2nd edition, vol. i. p. 149), who, as Cooley says ('The Negroland of the Arabs,' pp. 134-135) stood as occupants of the remote interior in a defined relation with the coast. According to Arab writers the Demadem invaded Abyssinia and Nubia in the early part of the thirteenth century.

|| Besides ivory Lief ben Saeid mentions especially textile fabrics as articles of commerce at the Victoria Nyanza. Textile fabrics are further mentioned by Pigafetta (see 'Purchas' Pilgrims,' vol. ii. fol. 1025, and by Ebn Haukal (Or. Geography, p. 14) as imported from the Zanzibar coast into the interior. This is another proof for the regular trade connection between the east coast of Africa and the interior which was established at all times.

from Ravenstein's new map, has probably a position of $0^{\circ} 22'$ S. lat. and $37^{\circ} 40'$ E. long.

The distance from the promontory of Rhaptum to the western Nile lake is on the old map 148, or reduced 123.3 mm.; to the western end of the Mountains of the Moon 150.3, or reduced 125.3 mm.; and to the confluence of the two rivers which form the Nile 151, or reduced 125.8 mm. The almost equal distances of these three positions from the Zanzibar coast is at once striking, and if our hypothesis is correct, that the eastern Nile lake is the Victoria Nyanza, the western one can but be assumed to be Lake Albert or Lake Albert Edward.* There is no other lake which could possibly meet the case. It must be remarked here, that the position of both Nile lakes seems to be very carefully considered by Ptolemy: the difference of latitude is noticed by him, and reference is so often made to their respective positions, as a sort of well-established basis for this interior part of Africa, that the importance which Ptolemy attaches to his knowledge of them is quite evident. It is difficult to understand how Cooley, in the face of this, can say that these lakes did not present themselves to Ptolemy's mind as realities, but were, in the form in which we now see them, to a great extent the work of imagination.† Cooley has made similar statements about the mountains of Kilima-njaro and Kenia, and how entirely wrong he was is well known.

Also other classical authors knew the Nile lakes as existing separately. Pliny says ‡ that, according to different authors, the Nile has its origin in several lakes between which is the country of the pygmies; Strabo, who has his information from Eratosthenes, states § that the Astapus, which is the chief river of the Nile system, flows from several lakes in the south; and that Marinus knew of them, but in a wrong position, we have seen previously.¶ It is generally acknowledged that the early Arab writers knew the two lakes, as well as the Mountains of the Moon. Masudi e. g. states ¶ that the Nile has its origin in twelve streams from the mountain of Komr, these flow into two lakes, and afterwards one single stream is formed.**

For all these reasons we must be able to explain the second Nile lake of Ptolemy if we have been able to put down the first correctly. The reduced distance in the ancient map from the promontory of Rhaptum to the western lake amounts to 123.3 mm., as we have seen, but a circle

* The Mountains of the Moon and the sources of the Nile are explained by Berlioux (Doct. Ptol., p. 28) to be the mountains of Kilima-njaro and Kenia, and the lakes, Victoria and Albert respectively.

† Cooley, 'Ptolemy and the Nile,' p. 41.

‡ Hist. nat., bk. vi. chap. 35.

§ Geogr., xvii. c. 1, § 2.

¶ The western Nile lake of Hipparchus, out of which flows the Astapus, can be no other than Lake Victoria: see Gosselin, Géogr. d. anc., vol. i. tab. i.

¶ 'Historical Encyclopedia,' p. 232.

** Compare Stanley, 'In Darkest Africa,' vol. ii.

with this goes several degrees beyond the western Nile lakes of our modern maps, and exactly the same is the case with the western end of the Mountains of the Moon, and with the confluence of the two rivers which form the Nile. This almost perfect equality of distance can hardly be considered accidental, and the following will be an explanation of it. On our modern maps the radii from the western Nile lakes (Albert Edward as well as Albert Nyanza) to our basis on the coast intersect Lake Victoria, whereas the route of caravans must necessarily be a strongly curved one, round the southern and western sides of this largest of the inner African basins, and this necessitates a further and considerable reduction for all points beyond Lake Victoria in the described position. Owing to the erroneously straight direction which Ptolemy gave to the itineraries known to him, and consequently also to the position of his lakes and mountains, he could not make this reduction himself. I think the probability that this is a correct explanation is shown by the fact that it holds with perfect accuracy equally good for the three important points in question, which on the Ptolemæan map are at great distances from each other, but in reality are not far removed from one another.

I have measured this reduction as follows:—On Stanley's map of 1878, a straight line was drawn from our basis at the promontory of Mamba Mku, south of Zanzibar, to the place where he discovered the Ruwenzori on his last journey. This line intersects Lake Victoria at Makongo Uzongora on the western, and at Mazanza on the eastern shore. The distance in a straight line between the two points is 73 mm., and a march around the southern shores of the lake, calculated as correctly as possible (with due consideration of Stanley's recently discovered bay), amounts to 130 mm. on this map of Stanley. Now the straight line between Makongo and Mazanza on the modern map which appears with this paper, is only 18 mm., and therefore the corresponding line round the lake is calculated to be 32 mm., and the difference between both 14 mm. It is evident that if the reduction proposed is correct, the exact place of the three mentioned positions of the ancient map must be obtained if these 14 mm. are subtracted from the numbers which we have found before, viz. 123·3 mm. for the Western Nile Lake; 125·3 mm. for the western end of the Mountains of the Moon; 125·8 mm. for the confluence of the two rivers which form the Nile.

Hence the new distances from the promontory of Rhaptum are:—109·3 mm., Western Nile Lake; 111·3 mm., western end of the Mountains of the Moon; 111·8 mm., confluence of the rivers; and as the map shows, these distances actually coincide with the Albert Edward Nyanza, the Ruwenzori, and the place where the Somerset Nile flows into Lake Albert.

It is difficult to say how far the ancients explored the Nile, following its course from Egypt. But it is not difficult to prove that the opinion published in Dr. H. Meyer's recent book, 'Across East African Glaciers,'

1891 (pp. 1-4), is untenable, viz. that Ptolemy's Nile lakes and Mountains of the Moon must be looked for in Abyssinia.

As it is desirable to settle definitely this hitherto more or less uncertain question about the Upper Nile, which is one of the most important questions of the ancient geography of Africa, I shall briefly state the necessary facts.

1. Dr. Meyer commences with the statement that it is shown by the map of Eratosthenes that the origin of the Nile was believed to be in a number of lakes in the vicinity of the Indian Ocean, if not indeed in the Indian Ocean itself. But this statement is in direct contradiction to the geography of Eratosthenes, as the passage in question, cited by Strabo,* will show:—"Two rivers empty themselves into the Nile which issue out of some lakes towards the east, and encircle Meroë, a considerable island. One of these rivers is called Astaboras, flowing along the eastern side of the island. The other is the Astapus, or as some call it, Astasobas. But the Astapus is said to be another river which issues out of some lakes on the south and that this river forms nearly the body of the Nile, which flows in a straight line, and that it is filled by the summer rains." We see that the lakes towards the east clearly refer to the eastern tributaries of the Nile, viz. the Abai and Atbara, and not a word is said that the chief river of the Nile system has its origin near or in the Indian Ocean.

2. As long as the White Nile was unknown, the Blue Nile might have been taken as the chief river of the Nile system, which has really been the case in modern times, but as soon as the former was explored, the latter could no longer be regarded as the principal stream. Therefore, the question arises, did the ancients know the White Nile sufficiently well to recognise its importance? In the face of the just-named passage of Eratosthenes there can be no doubt whatever that they did, because this passage is entirely unintelligible, if we do not accept the explanation that the White Nile as well as the Abai and Atbara were known to Eratosthenes, and that he considered the White Nile the chief river, forming the Nile system, a fact which has always been acknowledged by our best authorities.

3. Sir E. H. Bunbury has pointed out the very curious fact that Eratosthenes appears to have had no knowledge of the Highlands of Abyssinia, although he was not ignorant of the existence of mountains in that direction, and as Eratosthenes is one of the very best geographers of antiquity, we may safely conclude that Abyssinia was explored at a comparatively late period of antiquity, and perhaps more from the Red Sea than from the Nile, whilst the White Nile, far beyond Meroë, was known much earlier. It is therefore most unlikely that ancient geographers should have changed their views, and taken the much smaller river, coming from Abyssinia, for the Nile proper.

4. Dr. Meyer says that Ptolemy places a tribe called Catadupi near

* Bk. xvii. chap. i. § 2.

the Nile flowing from the south. He regards this as a proof that the river which Ptolemy represents as flowing out of the Equatorial lakes, must be the Blue and not the White Nile, because, as he says, "the cataracts really occur on what is known as the Blue Nile." This is an evident error, as it is impossible that Ptolemy's Catadupi, or, as they are also called, Duppi, have anything to do with the cataracts of the Blue Nile. Cicero * mentions a tribe of the same name, and Pliny has two passages † where he speaks of a tribe called Catapudi. Both Pliny and Cicero bring these natives in connection with the cataracts of the Nile, but the description of the former leaves no doubt that they were living below Meroe, where the rivers are already united, and therefore the cataracts of the Blue Nile have nothing whatever to do with them. Dr. Meyer might have avoided this great mistake by reading Pliny before making this statement.

5. The next proof that the ancient geographers possessed positive knowledge of the upper White Nile are the pygmies. Besides the numerous legends which have been current from the earliest times about these dwarf tribes of inner Africa, and to which I attach no importance, several trustworthy writers, such as Aristotle, Pomponius Mela, and Pliny, have mentioned them. Aristotle ‡ describes them as living near the lakes, from which the Nile flows, and emphatically adds, "this is no fable, for there is really, as it is said, a race of dwarfs, both men and horses, which lead the life of troglodytes." Pliny § speaks equally definitely, saying that according to different authors, the Nile has its origin in several lakes between which is the country of the pygmies. Strabo || does not believe in the existence of the pygmies, but this is more a criticism of the name, as he describes in the same passage other small sized tribes living in the same regions, hereby corroborating the evidence of the other authors. But in the source-region of the Blue Nile in the Abyssinian Highlands no dwarf tribes have ever been found, whilst we are now acquainted with the interesting fact that the pygmies exist in the proximity of the western source-region of the White Nile, which speaks for the correctness of the ancient geographers, both as regards their knowledge of the pygmies and of the upper White Nile.

6. Another conclusive proof against the Abyssinian Highlands is that passage in Ptolemy (bk. i. chap. 17) which we have already found of great importance as a definite statement that he had authentic knowledge of the great Inner-African lakes. We have seen that his information of these Nile lakes was obtained from merchants who travelled to Aromata, Azania, and Rhapta, places and countries which are so remote from Abyssinia, that it is quite impossible that the reports could have referred to this country. How could any knowledge obtained southward of Cape Guardafui or at Zanzibar refer to the source

* De re publica, vi. 18. † Hist. nat., v. 10 and vi. 35. ‡ Hist. Animal., viii. 2.

§ Hist. nat., vi. 35.

|| Geogr., xvii. c. 2.

of the Blue Nile and the mountains of Samen? Dr. Meyer makes the erroneous statements that we learn from the *Periplus* of the Erythræan sea that the Nile—which he identifies with Ptolemy's Astapus—was crossed beyond Axum, and that on the farther side of this river were situated the passes (*pylæ*) in modern Samen. Now, nowhere in the *Periplus* are the "*pylæ*" and the region of Samen at all mentioned, and to identify in this case the Nile with Ptolemy's Astapus is incorrect, because the passage of the *Periplus* is so vague, that it is impossible to decide which river was meant, and the ivory of which the *Periplus* speaks may have been brought from the White as well as from the Blue Nile or the Atbara. Another mistake of Dr. Meyer is to say that one of Ptolemy's Nile tributaries flows past Axum, whilst Ptolemy plainly remarks that Axum is remote from the rivers.

7. Herodotus* already explains that at his time the course of the Nile was known a four months' journey beyond Egypt, and the information which he collected personally at Elephantine extended far beyond Meroë. The last tribe which he describes in this direction are the Automoli who are about as far from Meroë to the south as Elephantine is to the north. In the country of the Automoli the Nile flows west to east, and Herodotus says that beyond this nobody is able to speak of it with certainty, for the rest of the country is desert, owing to the excessive heat. No Abyssinian river can possibly be meant by this description, and it is acknowledged that this information of Herodotus is authentic and trustworthy, and can only refer to the Bahr-el-Abiad which actually flows in the Bahr-el-Ghazal region from west to east.

In connection with this direction of the Nile, Herodotus mentions the possibility that the Nile might come from the far west of Africa, but he states plainly that he considers this nothing more than a quite uncertain hypothesis, based only on the well-known reports of the Nasamonian travellers who found such a river in the interior of Africa.

8. Diodorus† makes some further remarks about the upper Nile. He says that this river comes from the far and unknown south, where there are only deserts and regions inaccessible on account of the tremendous heat.

9. A great advance had evidently been made in the exploration of the White Nile at the time of Pliny. He mentions‡ not less than seven Greek and Roman explorers who travelled in the regions south of Meroë, viz. the expedition which Nero sent up the Nile, Dalion, Simonides, Aristocreon, Basilis, Bion, and Timosthenes, and from his text we can easily see that he had still other sources of information. Pliny's description of these countries is of high value, because it is the most detailed we have received from antiquity. Time will not allow us to enter into an exhaustive comparison between Pliny and the other writers, especially Ptolemy, the topography of most of these localities

* Bk. ii. chaps. 29-31.

† I. c. 32, 37.

‡ Hist. nat., vi. c. 35.

being beyond the limits of this paper. It is sufficient to say that from the coincidence of various details of the descriptions, the trustworthiness of Pliny, Ptolemy, and other geographers can be proved in many instances with perfect accuracy. Pliny knew both river systems distinctly, one coming from the far south, and the other from the Abyssinian mountains, and he considered the former the Nile proper. Pliny says that the above mentioned Dalion was the first who travelled south far beyond Meroë, and he further states that the younger Simonides lived five years in Meroë, in order to write his book about these parts of Africa. As Pliny shortly after mentions the pygmies and the Nile lakes, we can easily understand that reliable information about them may have reached one or the other of these explorers who communicated this information to the scientists of Alexandria and Rome.

10. I have already mentioned that Pliny was acquainted with the results of the expedition which the Emperor Nero sent up the Nile for the discovery of its sources, and it is well known that also Seneca * has written about this remarkable journey. His description is of more importance than anything else left us from antiquity about the upper Nile, because he obtained his information personally from the leaders of this expedition who were officers of the Roman army, and, as we know from an itinerary in Pliny, were careful and trustworthy observers. They related that they were able to penetrate very far up the Nile, as they had the support of the native chiefs, until they came to enormous swamps, where the river was covered with floating vegetation which made navigation impossible. Hence they were obliged to return without having reached the sources of the Nile, as the emperor had commanded. No modern critic has ever doubted that this exploring expedition went up the White Nile until they came into the swamps of the Bahr-el-Ghazal region, their description of the river being such as would be given at the present day. This is another conclusive proof that the sources of the Nile were not looked for in Abyssinia.

These are the views of the ancient geographers and explorers before Ptolemy's time, and from all the reasons given we are compelled to draw the conclusion that they did not consider the Blue Nile as the chief river of the Nile system. From the time of Eratosthenes they were well enough acquainted with the different rivers which form the Nile to estimate them exactly in the same way as we do in modern times. Ptolemy's Nile system is therefore not an invention of his own, but is derived from the careful study of geographers and explorers. Critics who will still persist in looking for Ptolemy's lakes and snow mountains in the neighbourhood of Abyssinia, can only do so with entire disregard of all evidence to the contrary. I think I have some right to say that many of the explanations given about this question have been nothing but mere speculations and guesswork, various geographers not

* *Quæst. nat.*, vi. c. 8.

having taken the trouble even to compare the extant writings of the ancient authors, and I quite agree with Sir E. H. Bunbury about "the unwillingness of modern writers to apply to the statements of ancient authors the same rules of reasonable criticism by which they would be guided in other cases."

It remains for me to add some details about the Ptolemaic lakes and mountains. It has been said that no hints can be found in Ptolemy regarding the dimensions of the equatorial Nile lakes, especially of the large extent of Lake Victoria. This is, however, not quite correct, as in book iv. chap. 7, Ptolemy makes some short allusions to this matter. It is stated there that a tribe, called the Mastitæ, live at the lakes, and the further description shows that only the eastern Nile lake can be meant. But the two principal indications which Ptolemy gives of the position of the Mastitæ, viz. *Maste mons* and *Maste oppidum*, make them distant from Ptolemy's position of the eastern Nile lake 180 and 140 miles respectively, and I think it is therefore not incorrect to assume that on Ptolemy's original map the lake extended in this direction, as shown on the map accompanying this paper. The western Nile lake is in reality much smaller, but to assume that Ptolemy or the people from whom he obtained his information would have overlooked it on account of its smaller size is erroneous, because the importance of this lake lies not in its size (which was probably larger in antiquity), but in its being the source of the western branch of the Nile. That this western Nile is not too remote for trade connections with the Zanzibar coast, is confirmed by a communication which Lieutenant Stairs was kind enough to make to me, viz. that products which are not found in the intermediate regions, e. g. Colobus skins, are brought from the western branch of the Nile to Zanzibar and sold there.

Perhaps even more celebrated than the lakes of antiquity are the Mountains of the Moon, as they are said to feed the lakes with their snows, and are therefore the earliest sources of the Nile. I have mathematically determined two points of the Mountains of the Moon, and seeing that it is quite impossible to look for them in Abyssinia, there is no other alternative left than to identify the Mountains of the Moon with the giant mountains of equatorial East Africa discovered in our century. This is in all respects the most natural explanation, confirmed alike by our mathematical results and by Ptolemy's description. Of course his placing these mountains too far south is one of his errors, due to the uncertain geographical latitude of all his positions in this part of Africa, as explained previously in this paper. But eliminating Ptolemy's errors as we have done, and then comparing his description with our modern map of East Africa, we come to the conclusion that his Mountains of the Moon are that series of high and partially snow-capped mountains which are situated not south of the lakes from which the Nile emanates, but west, north, and east of them.

Besides Ruwenzori and Kenia, we find there the high and lofty peaks of Mfumbiro, Elgon, Chibcharagnani, Silali, the probably snow-capped Lekakisera, and the most southern of them, the well-known Kilima-njaro. Many other important mountains cluster around these giants, and if we connect them on the map by a line we find a curve of such surprising regularity as can hardly be accidental, a point upon which their further geological exploration will doubtless throw some light. They do not, however, form an uninterrupted chain of mountains, as the ancients erroneously believed. They probably became known to the Greek merchants at Rhapta by trading caravans coming from Unyamwezi, and this may possibly explain their name. Other light is thrown upon this mysterious name by the following facts:—The mountain of "Komr," or "Kamar," is often mentioned by the earlier and later Arab geographers. There is no doubt that it is identical with Mr. Stanley's Ruwenzori. Much dispute has always been going on how this mountain came by its name, the Arab expression being identical with moon. But en-Nowairi* expressly states that Kamar besides moon signifies white, and this is a good explanation of the name of this mountain, which was always known to be snow-capped. It is very interesting to know that already Aristotle† states that the Nile originated in an *Ἀργυρὸς ὄρος*, and Vivien de Saint Martin‡ points out the singular analogy between this "Mont blanc," on the one hand, and the mountains of Komr, of Kilima-njaro, and Kenia, on the other; the analogy, however, is correct only if Ruwenzori is considered instead of Kilima-njaro and Kenia.

The connection of these mountains with the Nile lakes is, as I have mentioned, only a partial one, as there is, in fact, only one great group of mountains, viz. the Ruwenzori, from which, as Ptolemy says, the Nile lakes receive the snows. Mr. Stanley's discovery of this great snow mountain, surrounded by a series of other peaks, forms, so to speak, the key to the whole question of the Mountains of the Moon. For it is perfectly clear that by the Ptolemæan mountain, the snows of which feed the Nile lakes, only Ruwenzori can be meant, as may be seen from a glance at Mr. Stanley's map, where we find a great number of rivers (I have counted more than forty) which flow from the heights of Ruwenzori into the Semliki, or the Albert Edward Nyanza. We have seen that the western end of the Mountains of the Moon, as described by Ptolemy, coincides with Ruwenzori, and Mr. Stanley is therefore perfectly justified in claiming to have found and identified the lofty peaks, celebrated in antiquity, in which the Nile takes its rise, and which, for many centuries past were more enigmatical than any other mountain in the world.

Here my investigations terminate. I have tried to establish a mathe-

* See el-Masudi, p. 204.

† 'Meteorologica,' bk. i. chap. 13.

‡ Hist. d. l. Géogr., pp. 105, 606.

matical relation between the principal points given by Ptolemy and the most important localities of modern Equatorial East Africa, and we have seen that the calculations proved accurate in almost every case.* I consider my explanation only as a theory, but it is one which explains fully and easily many hitherto unsolved questions of the ancient geography of East Africa, of which, as Guillaumin correctly says, hitherto explanations have been given which are as uncertain as the identity of ancient and modern geographical names.

The literature of the last twenty years shows that more justice has been done to Ptolemy's African geography during this period than ever before, and if this paper should lead to further comparative study of the ancient and modern geography of Africa, I shall be much gratified.

APPENDIX I.—PTOLEMY'S DESCRIPTION OF EASTERN EQUATORIAL AFRICA.

Translated by HENRY SCHLICHTER.

Note.—For this translation the critical editions of Wilberg and Mueller are chiefly used. All repetitions and statements without scientific value are omitted.

Book I. chap. 7.—The country of the Ethiopians which is called Agisymba and the promontory of Prasum, are, according to Marinus of Tyre, situated under the geographical latitude which terminates the most southern part of the known world.

Book I. chap. 9.—About the navigation between Aromata and Rhapta, Marinus reports that a navigator named Diogenes, when returning from India on his second voyage, was caught near Aromata by the north wind, and having the country of the Troglodytes to the right, he came after a journey of twenty-five days to those lakes out of which the Nile flows, and from which the promontory of Rhaptum is somewhat more south. Marinus further reports that a certain Theophilus, one of those who sail to Azania, left Rhapta during a south wind, and arrived at Aromata after a journey of twenty days. But neither of these has stated what the usual average time of sailing between Aromata and Rhapta is. This time cannot be ascertained from their statements, on account of the irregularity and changes of the winds during such a long time of sailing, and because it is not said whether the journey was in the first case due south and in the second due north. Diogenes reckons a day and a night's navigation to be 1000 stadia, a calculation which Marinus considers correct; but in opposition to this Marinus reports that Dioscorus has stated that the distance from Rhapta to the promontory of Prasum is only 5000 stadia, although it takes many days to perform the journey.

Book I. chap. 14.—It has been demonstrated, by reasons which are easily intelligible as well as by astronomical facts, that the latitude of Prasum † is $16^{\circ} 35'$ S., and the latitude of Aromata is $4^{\circ} 15'$ N., so that the distance between Aromata and Prasum is $20^{\circ} 40'$.

Book I. chap. 15.—Marinus says that the true and real course of the river Nile is described to be directly northward from its origin until it reaches Meroe, but he

* I am well aware of the great errors and mistakes which Ptolemy's description contains, besides those mentioned, e. g. the totally wrong position of Lake Coloe and of the Island of Menouthias, and the confusion in the names of the rivers near the "Island of Meroe." † This latitude is taken by analogy from that of Meroe, see bk. I. ch. 10.

further states that those lakes out of which the Nile flows can be reached by sea in sailing from Aromata with the north wind. Aromata is, however, much more to the east than the Nile, for Ptolemais Epitheras is about ten or twelve days' journey east from Meroe and the Nile, and the distance from Ptolemais and the Bay of Adulis to the straits between Dire and the Chersonesus of Ocelis is 3500 stadia, and the promontory of Great Aromata is 5000 stadia further to the east.*

Book I. chap. 17.—In which chapter Marinus dissents from such investigations as have been made in our [viz. Ptolemy's] time. . . . Furthermore, what we have learnt from merchants who travelled from Arabia Felix to Aromata, Azania, and Rhapta, to which whole district they give the characteristic name of Barbaria. That is, that the navigation does not proceed directly southward but to the south-west, and from Rhapta to Prasum to the south-east; and that the lakes out of which flows the Nile are not in the neighbourhood of the sea itself, but much farther in the interior of the country; and that the course of the low and steep shore from the promontory of Aromata to that of Rhaptum differs from what Marinus states it to be; moreover, that in these regions a day and night's navigation do not comprise many stadia on account of the sudden changes of the winds at the equator, a distance of 400 or 500 stadia being generally the average; further, that a bay is near Aromata and the village of Panum situated in it, one day's journey distant from Aromata. From this village the emporium of Opone is distant another day's journey,† and then comes a second bay. Here begins the country of Azania,‡ near the promontory of Zingis and the mountain of Phalangis, which has three peaks. This bay is called Apocopa,§ and can be passed in two days and two nights. Then, three courses distant, we find the Little Strand, and another place which is called the Great Strand, and is five courses distant from the former; both these distances can be accomplished by sailing in four days and four nights. Then follows another bay in which is situated an emporium called Essina, reached after a further navigation of two days and two nights; next comes the station of Sarapion, after a navigation of one day and one night; and then commences the bay which extends to Rhapta, and is a three days' and three nights' journey by ship. Near the beginning of this bay is an emporium which is called Tonike, and not far from the promontory of Rhaptum is the river Rhaptus and the capital with the same name, the latter being inland, but not far from the coast. From Rhaptum to the promontory of Prasum extends a very large but shallow bay, the shores of which are inhabited by cannibals.

Book IV. chap. 7.—Bay of Adulis:—

	Ptol. Long. (Alexandria 60° 30')	Lat. North.
Sabat oppidum	68°	12° 30'
Montuosa Chersonesus	68°	12° 10'
Adulis	67°	11° 40'
Saturni promont.	68°	11° 40'
Antiochi Solen	72°	10° 15'
Mandaeth vicus	73° 45'	10° 20'
Arsinoe	73° 45'	10° 40'

* About the inaccuracy of this itinerary compare Bunbury, 'History of Ancient Geography,' 1879, vol. ii. p. 551.

† This is the version given in Müller's critical edition of Ptolemy, Paris, 1883, vol. i. p. 46.

‡ The first palm-trees, south of Hafun, are found near Askule in 2° 40' north latitude.

§ Krapf, 'Reisen in Ostafrika,' vol. ii. p. 422, affirms that along this coast many small bays or gulfs are found; the "Bay of Apocopa" is explained in the more detailed report of the Periplus, where Great and Little Apocopa are spoken of as two separate localities. (See Periplus, chap. 15.)

Outside the straits :—

	Ptol. Long.	Lat. North.
Dire oppidum in promont.	74° 30'	11°

Avalitian Bay :—

Avalites emporium	74°	8° 25'
Malao	78°	6° 30'
Mundi	78°	7°
Mosylum promont. and emporium ..	79°	9°
Cobe emporium	80°	8°
Elephas mons	81°	7° 30'
Acannæ emporium	82°	7°
Aromata promont. and emporium ..	83°	6°

Bay of Barbaria :—The sea of Barbaria extends as far as the promontory of Rhaptum.

Panum vicus	82°	5°
Opone emporium	81°	4° 15'
Zingis promontorium	81°	3° 30'
Phalangis mons	80°	3° 30'
Apocopa	79°	3°
Austri cornu promont.	79°	1°
		Lat. South.
Parvum littus	78°	1°
Magnum littus	76°	2°
Essina emporium	73° 30'	3° 30'
Sarapionis statio and promont. ..	74°	3°
Tonike emporium	73°	4° 15'
Rhapti fluvii ostia	72° 30'	7°
Rhapta, metropolis of Barbaria (some- what distant from the sea)	71°	7°
Rhaptum promont.	73° 50'	8° 25'

The island of Meroe is formed by the Nile and the Astaboras, the former flowing on the western and the latter on the eastern side around it. The following localities are situated in this island :—

		Lat. North.
Meroe	61° 30'	16° 25'
Sacolcho	61° 40'	15° 15'
Eser	61° 40'	13° 30'
Daron vicus	62°	12° 30'

Then follows the confluence of the Nile and the Astapus :—

61° 12°

and the position where the Astaboras flows from the Astapus :—

62° 30' 11° 30'

Then the confluence of the rivers which flow from two southern lakes and form the Nile :—

	60°	2°
		Lat. South.
The western Nile Lake	57°	6°
The eastern Nile Lake	65°	7°
		Lat. North.
Lake Coloe from which the Astapus flows	69°	0°

And remote from the rivers are the following inland places :—

	Ptol. Long.	Lat. North.
Auxume, the residence of a queen ..	65° 30'	11°
Coloe oppidum	62°	4° 15'
		Lat. South.
Maste oppidum	65°	4° 15'

On the whole western side of the Nile are mountains situated which are usually called the Ethiopian Mountains, and having the following positions :—

	Lat. North.
55°	23°
and 55°	8° 30'

On the eastern side of the Nile is a mountain called Garbatus, the central part of which has the following position :—

		Lat. North.
	69°	6°
Moreover, Elephas mons	78°	5° 30'
The Pylei montes, near the lakes ..	65°	0°
		Lat. South.
Maste mons	68°	5°

The whole shore which is adjacent to the Arabian and Avalitian bays to the mountain of Elephant is generally called the country of the Troglodytes, of which the Adulites and the Avalites are the inhabitants. The Mosyliars live above the promontory and emporium of the same name. The whole coast from here to the promontory of Rhaptum is called Barbaria, but the country which is more inland is called Azania,* and abounds in elephants.

East of the Nile and south of the promontory of Bazium live the Colobi. South of these the Tabieni. Then the Syrtibes, Apiri, Babyllenii, and Rhizophagi. After these follow the Auxumitæ, who live at the following locality :—

Ptol. Long.	Lat. North.
65°	11°

and the Soboridæ, then the Molibæ, Megabardi, and Nubæ who live west of the Avalitians. South of the Molibæ come the Blemmyes, and south of these the Dedacæ. Between the river Astapus and the mountain of Garbatus live the Pechini, and west from these the Struthophagi. South of the mountain of Garbatus is the country of the Catadræ and the Myrrh country, the latter extending to Lake Coloe. Then follow the Mastitæ, the country of whom extends to the Nile lakes.

The regions west of the Nile and south of the great cataract are inhabited by those who live in Triacantaschoenum between the Ethiopian Mountains and the Nile. South of these are found the Euonymitæ. Then comes Middle Ethiopia and the country of the Sebridæ. The island of Meroe belongs to these tribes. More to the south live the Gapachi and south of them the Ptoemphanæ. Then follow the Duppi and the Elephantophagi Ethiopians. Then the Pesendaræ. North of the lakes is the Cinnamon country. Between the Nile and the river Astapus in the island of Meroe live the Memnones. More to the south live the Sapæi.

The following islands are situated in the southern part of the Arabian Sea :—

	Ptol. Long.	Lat. North.
Acanthine insula	68° 30'	15°
Macaria	68° 30'	14°
Avium	69°	14°
Bacchi and Antibacchi	69° 30'	13° 15'
Panis insula	68° 40'	12°
Diodori	70°	12° 30'
Isidis	70°	11° 30'

* Already Pliny knew the expression "Azania" (see Hist. Nat., vi. c. 34).

Book VI. chap. 7.	Ptol. Long.	Lat. North.
Combusta insula	70° 30'	14° 30'
Malichæ duæ insulæ	71° 40'	14°
Adani duæ insulæ	72° 30'	12° 30'

Book IV. chap. 7.—Island in the Avalitian Bay :—

Mundi insula	77°	8° 30'
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Islands in the Erythræan Sea, south of Aromata :—

Amici insula	85°	4°
Mena insulæ duæ	84°	2° 30'
Myrsiaca insula	83° 30'	1°

To the east of these islands the ocean is called the Sea of Hippalus, and to the east of this the Indian Sea extends.

Book VI. chap. 7.—Islands in the Erythræan Sea :—

	Ptol. Long.	Lat. North.
Agathoclis duæ insulæ	81° 20'	10°
Coeconati tres insulæ, quarum medium	83°	9°
Dioscoridis insulæ oppidum	86° 40'	9° 30'
" " terminus occi-		
dentalis	85°	10° 30'
Trete	86° 30'	12°

Book IV. chap. 8.—Ethiopia, which is situated south of these regions and of the whole country of Libya, is terminated northward by a line reaching from the promontory of Rhaptum (73° 50' Ptol. long., 8° 25' S. lat.) to the large bay of the exterior ocean, and by that part of the western ocean which is near it. West and south it is terminated by unknown country. On the eastern side it reaches from the promontory of Rhaptum and the Bay of Barbaria (which is called the "rough sea" on account of the force of the waves) to the promontory of Prasum. After that the country is unknown.

The position of the promontory of Prasum is :—

Ptol. Long.	Lat. South.
80°	15°

To the east of it lies an island called Menouthias at :—

Ptol. Long.	Lat. South.
85°	12°

The inhabitants around this bay are the Ethiopian cannibals. To the west extends the Mountain of the Moon from which the Nile lakes receive the snows. The positions of the ends of the Mountain of the Moon are :—

Ptol. Long.	Lat. South.
57°	12° 30'
and 67°	12° 30'

North of it are the Rhapsii Ethiopians. Near the unexplored country is the widely extending region of the Ethiopians called Agisymba.

APPENDIX II.—In the following table the millimeter distances which occur in the paper are given in degrees. For the calculation of this table, as well as for the minute accuracy in reproducing the maps, I have to thank Mr. H. Sharbau, cartographer to the Royal Geographical Society.

Distances from Rhaptum Promontory in millimeters and degrees.
5 degrees = 44 mm. or 1.73 inches.

				mm.	- $\frac{1}{8}$	degrees	- $\frac{1}{8}$
To Rhaptus fluv. . .	. .	. .	. .	17·5 =	14·6 or	2·0 =	1·7
" Tonike . .	. .	. .	. .	37·0 =	30·8 "	4·2 =	3·5
" Essina . .	. .	. .	. .	42·7 =	35·6 "	4·8 =	4·1
" Serapion . .	. .	. .	. .	47·0 =	39·2 "	5·3 =	4·4
" Magnum Littus . .	. .	. .	. .	59·3 =	49·4 "	6·7 =	5·5
" Parvum Littus . .	. .	. .	. .	74·7 =	62·3 "	8·5 =	7·1
" Austri cornu . .	. .	. .	. .	94·4 =	78·7 "	10·7 =	8·9
" Apocopa . .	. .	. .	. .	110·0 =	91·7 "	12·5 =	10·4
" Phalangis . .	. .	. .	. .	117·5 =	97·9 "	13·3 =	11·1
" Zingis . .	. .	. .	. .	122·0 =	101·7 "	13·8 =	11·5
" Opone . .	. .	. .	. .	127·5 =	106·3 "	14·5 =	12·1
" Panum vicus . .	. .	. .	. .	137·5 =	114·6 "	15·6 =	13·0
" Aromata . .	. .	. .	. .	150·0 =	125·0 "	17·0 =	14·2
" E. Nile Lake . .	. .	. .	. .	78·0 =	65·0 "	8·8 =	7·4
" W. " . .	. .	. .	. .	148·0 =	123·3 "	16·8 =	14·0
" E. end of the Mountains of the Moon . .	. .	. .	. .	71·0 =	59·2 "	8·1 =	6·7
" W. " " " " " " . .	. .	. .	. .	150·3 =	125·3 "	17·1 =	14·2
" Confluence of Nile . .	. .	. .	. .	151·0 =	125·8 "	17·2 =	14·3

The following discussion ensued on the reading by the author of an abstract of the foregoing paper.

3. **Lieut. STAIRS, R.E.:** I am sure we have all listened with intense interest to the very able paper which Dr. Schlichter has read to us, and I have no doubt that many of us present here are interested deeply in the discussions which have taken place for many centuries past, and which we hope now are being brought to a satisfactory conclusion. The locality of the sources of the Nile and the Mountains of the Moon have been subjects that have interested many nations and peoples from time almost immemorable. I think at least, from the discoveries which have been made in Africa within the last twenty-five to thirty years, we are in a fair way now of arriving at a satisfactory conclusion, fixing the Mountains of the Moon and the sources of the Nile. I think there can be no doubt that Mr. Stanley was right, and that Mount Ruwenzori and the mountains round it are the Mountains of the Moon of Ptolemy, and what Dr. Schlichter has said this evening more fully bears that out. Of course, the way in which Ptolemy arrived at his data was precisely the same as we arrive at ours; but we have instruments and appliances Ptolemy never knew of, and are able to fix localities with much more exactitude. Then, as now, information was derived from the routes of sailors and travellers who went into the interior for ivory and gold, and they calculated their distances by time, i.e. the time from one point to another, getting their bearings by the sun. Another way of arriving at information was by means of dwarfs. In every large tribe in Central Africa dwarfs are kept, either for curiosity or for their powers of tracking and bushcraft. They found their way to Egypt and Persia, and from them Ptolemy must have obtained certain information about the localities of the Mountains of the Moon and the sources of the great river. I am sure Dr. Schlichter

has enlightened us on many points to-night, especially on the geography of East Africa down to the latitude of Zanzibar. One very important point for consideration is the word Unyamwezi, the meaning of which is, the man of the moon. I do not know how that name originated, but perhaps some of our savants present this evening can tell us.

MR. CLEMENTS MARKHAM: We have, I feel sure, all welcomed this paper, as coming from a man who has studied the earlier geographers very carefully, and who has given us a treat very rarely enjoyed at the meetings of this Society, namely, a paper on historical geography. I differ from him in this: I think that Ptolemy was a little too much given to editing his information, and that if he had given us his vague stories exactly as he received them we should have much more correct and detailed information about Africa as known in Ptolemy's time. I also venture to think that Ptolemy himself is a little too much edited; it is unfair to make measurements or to attempt to fix positions in the case of a man who only himself professes to give approximations. But the whole story of Ptolemy's geography is extremely interesting, and we have to thank the reader of the paper very much for having brought the subject before us to-night.

We have two distinct fixed points from which we may be certain that Ptolemy received his information about Eastern Africa: Adulis within the Red Sea, and Rhapta farther to the south. Adulis was undoubtedly at that time a place of great importance, and the traveller Cosmas Indicopleustes informs us that he found among the ruins a marble throne, on which was an inscription recording how the country had been conquered by the third Ptolemy. When I myself visited the ruins, now a good many years ago, I found there the drums of fluted columns and remains of capitals, and I recollect that Dr. Lumsdine instituted some excavations and found a Greek pair of scales, which may be considered as emblematic of the commercial importance of the place. Little, however, was done, and I have not the slightest doubt that if the Italians or others were carefully to excavate among the ruins they would be very well rewarded. Ptolemy was well acquainted with the two great rivers of Abyssinia, and with the lake from which one of them flows, which he put down incorrectly in his map, knowing very little about distances and bearings. Ptolemy obtained all this information from Adulis, which in his time was the most important centre of trade on the eastern coast of Africa. With regard to Rhapta we are not so certain. Ptolemy mentions merchants with whom he conversed; and he appears to have obtained most of his information from merchants of Musa in Arabia. The position of Rhapta is probably correct as given by the author of the paper. Ptolemy might have heard of the two lakes and of the Mountains of the Moon from the Musa traders. In Unyamwezi, or "the Land of the Moon," we have the name quite clearly. Since Sir Richard Burton's journey I have always considered that Unyamwezi, whence the waters flow which help to swell the lakes of the Nile, was the Mountain of the Moon. On these points Ptolemy no doubt obtained most of his information from the Greek merchants who went from Musa to Rhapta. This information would be in respect of the main sources of the Nile, not of the Abyssinian sources, and I see nothing improbable in his having heard of the two lakes. It seems clear to me also that if Rhapta is correctly placed on the river Pangani, the snow-clad mountain of which he had evidently heard is the mountain from whence the Rhaptus Fluv. flows, that is Kilima-njaro. Ptolemy confused this snowy peak with the tableland of which he had also heard, called Unyamwezi or Mons Lunæ. The idea that the Mons Lunæ was one mountain is not, however, borne out by Sir Edward Bunbury, for he tells us that Ptolemy generally spoke of ranges of mountains in the singular. The rivers placed on the map as flowing from the Mons Lunæ into the lakes are said not to have been put there by Ptolemy,

but by Agathodæmon, who appears to be used as the whipping boy for Ptolemy. This Agathodæmon is accused of misrepresenting the geography of Ptolemy on the maps he drew. But there is no ground for such a belief. Agathodæmon is mentioned in two codices as the draughtsman of the maps; and doubtless he merely copied, correctly enough, what was placed before him. [But although Ptolemy, and not his draughtsman, must bear any blame that attaches to errors in the maps, he is certainly well able to do so. Yet I am anxious not to be thought to speak disparagingly of one who did more for geography than any other man in history, and I think we owe a debt of gratitude to any one who criticises and brings before us and reminds us of the great work of Ptolemy.]

Mr. RAVENSTEIN said that he fully appreciated the great trouble which Dr. Schlichter had taken with his paper, and was therefore sorry that he could not in every instance agree with that gentleman's conclusions. Dr. Schlichter had started a somewhat novel theory as to the manner in which Ptolemy prepared his maps. It appeared to him to be obvious that Ptolemy would have proceeded in pretty much the same way as a modern cartographer would under similar circumstances. The great cartographer had at his disposal a very few latitudes and a large number of itineraries. These latter he would naturally reduce first of all to a uniform scale, and then combine the whole, and insert them upon a graduated map. Unfortunately, in graduating his map, he assumed a degree to measure only 500 stadia, instead of 600, and this, as had been pointed out by Dr. Schlichter, rendered a comparison between his maps and our modern ones, a matter of some difficulty, except in those cases where no latitudes at all had been available, when we merely needed to divide the degrees into 500 stadia in order to obtain a correct scale. Ptolemy knew of the stereographic projection, but he preferred a conical projection for his general map; whilst for his special maps he contented himself with a cylindrical projection, the middle parallel of each of which was measured off according to its correct proportions. Dr. Schlichter was mistaken in supposing that he made use of the projection of Marinus, which he justly condemned, for this was a plane chart or cylindrical projection, having only the degrees along a single parallel, that of Rhodes, proportional to the degrees of latitude. He could not conceive that Ptolemy should have compiled his map upon a globe, and nothing in his 'Geography' appeared to justify such an assumption. The existing maps he looked upon as reductions of the original ones, which latter must have contained every name to be found in the 'Register' which accompanied them, and was hardly more than an index, like that of our modern atlases.

He now passed to Dr. Schlichter's identifications of Ptolemy's names along the east coast of Africa. He had no fault to find with the position assigned to Rhaptum promontorium, but confessed he was taken aback when he found the author of the paper identifying Dire, at the entrance of the Red Sea, with our modern Cape Guardafui, whilst he placed Aromata prom. far to the south, at Cape Aswad. No statement more injurious to Ptolemy as a cartographer could be made, and if he had been capable of making so palpable a blunder it would scarcely be worth while to deal seriously with any information he might have given as to the interior. Dr. Schlichter appeared to believe that a position assigned to Aromata in book I., namely, $4^{\circ} 15' N.$, was based upon "astronomical observations," and confirmed his hypothesis; but this was clearly a mistake, as Ptolemy merely referred to "celestial phenomena," and not to observations. The latitude assigned to this cape in book viii. was $5^{\circ} 40' N.$, in the map it was $6^{\circ} N.$ Ptolemy stated that a voyage from Aromata to Rhaptum promontories occupied twenty-six half days or "courses," and as the distance measured along the coast was 1410 geographical miles, this would be 54 miles, or 540 stades to the course, which was reasonable—Ptolemy himself admitting that 500 stades would be a fair average. Dr. Krapf, in one of his coast voyages in a native craft from Cape

Guardafui to Zanzibar, spent fourteen days upon the voyage, and averaged 55 miles for each half day. If these "courses" were of equal length it would be easy to locate each place along a coast-line of such uniformity as was that of eastern Africa. As this could not be assumed, Dr. Schlichter had preferred to measure off the distances on Ptolemy's map, taking Rhaptum prom. as a base, and improperly ignoring the sinuosities of the coast as shown on the map, which would have increased the distance to Aromata to the extent of 100 miles. Ptolemy's map, however, contained many palpable errors. Thus (book i. c. 17) we were told that the river Rhaptus was not far from the promontory Rhaptum, and that the town Rhapta was near the coast. Yet on the map we found that from the cape to the mouth of the river was 100 miles, and that the town lay 75 miles inland. Again, if Wasin was really one of the Pyralean islands, as assumed by Dr. Schlichter, a voyage to Menuthias, identified with Zanzibar, could hardly have occupied four "courses," the distance only amounting to 90 miles. Pemba, moreover, corresponded more satisfactorily with the Menuthias of the Periplus, and the distance in that case would be reduced by one-half.

The location of the places along the coast, however, was of very inferior interest to that of Ptolemy's lakes and snowy mountains. These lakes, for want of other information, had retained their place upon our maps until quite recently, and when great lakes were actually discovered by Burton and Speke it was at once concluded that this discovery confirmed Ptolemy's geography. This popular view he did not share. Dr. Schlichter must be perfectly aware that if he had retained Ptolemy's distances and bearings in placing these lakes upon a modern map, no such coincidence would have been discovered. The eastern lake of the two would then have occupied the centre of Unyamwezi, the western lake would have been placed to the west of the Nyangwe, whilst the Mountains of the Moon would have stretched from the northern end of Nyassa to far beyond Msiri's capital. To make Ptolemy's statements suit his (Dr. Schlichter's) hypothesis he had not only to a very considerable extent reduced that geographer's distances, which might be allowed to pass, though Ptolemy explained that all his itineraries had been reduced by himself to reasonable proportions, but he had also rejected all Ptolemy's bearings, and had thus completely changed the positions of all places. He had thus managed to identify the eastern extremity of the Mountains of the Moon with Mount Kenia which lay to the N.N.W., and not to the south-west of Rhaptum, as stated by Ptolemy, whilst the western extremity of these mountains which Ptolemy placed 300 miles due south of his western lake, was actually placed by the side of it, and identified with Ruwenzori. Such an arbitrary manipulation of Ptolemy's statements he (Mr. Ravenstein) considered to be quite inadmissible. He was quite willing to admit that in ancient as in modern times, caravans coming from far distant regions might have brought ivory and slaves to the coast-towns, but he was equally sure that the information derived from them was of the scantiest, up to a quite recent period. It was thus the reports of a powerful empire known to the Portuguese as Monemugi, and supposed to be the modern Unyamwezi, or Land of the Moon, were received on the coast, and this might account for the mountain named after it. But, however this might be, Ptolemy's 'Geography' exhibited no sign that he had full information on this part of Africa. Elsewhere in Africa, where he had itineraries leading into the interior, he placed a multitude of stations upon his map; but in eastern Africa no trace of his having had such an itinerary could be discovered. In criticising Marinus, Ptolemy said that his predecessor was mistaken when he supposed the lakes of the Nile to be "near the sea," for that they were "much farther" in the interior. This, he says, was told him by Greek merchants who traded on the coast of Azania. But for all this Marinus was right as to the position of certain

lakes, although he erred, as his Arab successors erred, when he connected these lakes with the Egyptian Nile. Artemidoros, long before Ptolemy, referred to lakes in the Afar country, as also to a river Isis, which could be no other than the Hawash. He moreover placed a large reservoir, fed by rivers from the mountains, and the head of a river "Nile" into the interior of the Somal country. This Nile could be no other than our modern Leopard river, which terminated in a lake near Madisha, and may formerly have reached the sea through the Jub. These were no doubt some of the lakes referred to by Marinus—they had found no place on Ptolemy's map, who appeared to have removed them bodily into the interior. In confirmation of this we found that the rivers which issued from Ptolemy's lakes flowed through the "cinnamon land," not elsewhere mentioned by Ptolemy, but which must undubitably be looked for on the northern Somal coast. Add to this, that apart from the "Mountains of the Moon" and the Rhapsii absurdly supposed to inhabit them, Ptolemy's map did not give us a single proper name; that there was absolutely no trace of an itinerary to be found upon it; that no snowy mountains existed in the regions in which they were placed by Ptolemy, and we are bound to admit that these speculations rested upon a very slender foundation. His own conclusion was that these Ptolemaic lakes were merely the well-known coast lakes shifted hypothetically into the interior, and connected with the Nile, whilst the only African snowy mountains known to the ancients were those of Semen in Abyssinia. The very utmost he could concede would be this, that Ptolemy had some vague information about these inland lakes. In that case, however, they ought to be identified with the Victoria and Tanganyika, and not with the remote and hidden Albert Edward.

As to the Arabs, they retained Ptolemy's two lakes and connected them with a third lake, the Kura or Kavar, which gave rise both to the river of Ghana, that is the Niger, and to a river flowing to the eastern ocean, that is the Hawash or the Nile of Makadesho. This third lake looked very much like a combination of the Tsana with Lake Tsade.

Dr. SCHLICHTER, replying to the previous speakers, said:—

In the first place, I have to thank Lieutenant Stairs for his information, which is of special interest to me. That the ancients knew of the dwarfs of Inner Africa is quite certain, and if some of them are found amongst other tribes all over Central Africa, as Lieutenant Stairs says, this explains why the pygmies were known so early in antiquity.

With reference to what Mr. Markham said, I have to remark that Ptolemy left us some reports of navigators who traded with East Africa and India, although as a rule he does not explain his itineraries and other sources of information in his tabulary arranged work unless he has a special object in doing so. In the first Book his purpose is to find out the limits of the then known world, and he gives the stories of navigators to confirm his information. As regards Unyamwezi, I am glad that Mr. Markham shares my view that the inhabitants of that country have always had trade connections with the coast. It is most likely that these intelligent people in many cases brought information about the interior to the coast, and I certainly will not deny the possibility that there may be some actual connection between Unyamwezi and Ptolemy's Mountains of the Moon.

In reply to Mr. Ravenstein, I have to remark that what he calls the popular view about Ptolemy—which he does not share—is in fact the critical view accepted as correct by all our modern authorities on ancient geography, e. g. Bunbury, Norden-skjöld, C. Mueller, W. Smith, and many others. Mr. Ravenstein's view, on the other hand, contains errors which I shall enumerate and refute as briefly as possible.

1. I do not say in my paper that Ptolemy used the incorrect projection of

Marinus which he condemned. This projection is, however, used in 26 of the 27 maps which accompany Ptolemy's text, and are said to have been drawn by Agathodæmon. Nordenskjöld, prior to my having done so, pointed out this great inconsistency, and I have mentioned this in my paper as one of the various proofs that Ptolemy had nothing to do with the construction of Agathodæmon's maps.

2. I referred in my paper to the elaborate criticism of Gosselin—well known to all writers on ancient geography—by which it is proved beyond doubt that Ptolemy was completely confused about Dire and Aromata, and that in fact Ptolemy's Dire has a position which can only correspond to our modern Cape Guardafui. By an erroneous combination of itineraries Ptolemy has, however, retained the actual position of Dire at the Straits of Bab-el-Mandeb, but the whole coast line west of it ought in fact to be east and outside of the straits. It would occupy too much time to enter into a repetition of Gosselin's careful and detailed arguments, but I may mention that Ptolemy's southern shore of the Red Sea is enormously extended, and the island of Diodorus, which corresponds to the modern island of Perim in the straits, is left far to the west. The same is the case with the islands of Adani, which are in reality likewise at the straits, and Antiochi Solen is a place much more east on the Somali coast. This error is probably due to the erroneous length of Ptolemy's degree, and I have specially pointed out in my paper that so good an authority as Mannert has shown that owing to this reason Ptolemy's whole map south of Egypt is in part drawn too small, and in part unnaturally extended. Mr. Ravenstein remarks that in the passage where the latitudes of Aromata and Meroe are given (Cape Prasum being taken only by analogy from Meroe (see bk. i. chap. 10), Ptolemy does not refer to astronomical observations, but merely to "celestial phenomena." As far as I know, the only "celestial phenomena" used in antiquity for the determination of geographical latitudes were the altitude of the stars and of the sun, the latter being ascertained by the shadow of the gnomon. The length of the day could not be used for this purpose, because it is impossible to measure it with anything like accuracy, and Ptolemy calculated it after having ascertained the latitudes. The astronomical determination of a latitude could only be made by accurate observations of these celestial phenomena, and it therefore comes to exactly the same thing, whether we translate Ptolemy's *ἐξ αὐτῶν τῶν φαινομένων* by astronomical facts or by celestial phenomena. That the sense is astronomical, compare Eudoxus, Aratus, and other authors, as well as C. Mueller's critical edition of Ptolemy. For these and other reasons given in my paper, I cannot but firmly adhere to my conclusion, that Ptolemy's Aromata cannot be the Cape Guardafui of to-day, a statement which is fully corroborated by the best ancient information still extant about this point which is acknowledged to be perfectly reliable, viz., that of Juba (cited by Pliny) who says that the Indian Ocean begins at the promontory of Mosylum.

3. Ptolemy mentions different sea journeys between Aromata and the Rhapta territory, one of them being a journey of 26 half-days or "courses" (bk. i., chap. 17). Here Mr. Ravenstein makes a mistake in calculating the average length of these "courses" at 540 stadia each, saying that Ptolemy himself admits 500 stadia to be a fair average; whilst in fact Ptolemy takes 400 or 500 stadia as the average for one day and night's sailing, that is to say for *two* "courses" (see bk. i. chap. 17). Hence the calculations and figures given by Mr. Ravenstein are more than twice the correct length. The distance of Wasin Island from Zanzibar, e. g., is in perfect accordance with Ptolemy's measurement of the "courses." As regards Pemba, I refer to the remarks in my paper.

4. By what rules and for what reasons I have reduced Ptolemy's distances is explained in my paper, and I cannot accept the partial admission that "this might

be allowed to pass," as mathematical results must either be correct or incorrect. As regards bearings in the interior, it follows from Ptolemy himself that these cannot be retained, as he states his ignorance about the latitudes of these regions. My view about the rejection of bearings is confirmed by our greatest modern authority in ancient geography, Sir E. H. Bunbury, who says that the want of correct bearings is always one of the greatest difficulties with ancient geographers. Therefore, my treatment of Ptolemy is neither "arbitrary" nor "inadmissible," but is in fact the only way by which exact comparisons, based upon calculations, and not on mere conjectures, have hitherto been possible between our modern geography and unknown ancient positions.

5. As it is admitted that trade existed between the far interior and the coast in ancient times, no reason can be found for the assumption that the information derived from caravans in antiquity was scantier than in more recent times, as it is proved beyond doubt that perfectly reliable information was obtained from intelligent native traders about the interior many years before Europeans explored these regions. It was not Ptolemy's intention or plan to give itineraries in his work, and wherever he did so it was only for some special purpose, as is fully shown in his first Book. Further India, East Scythia, West Africa, &c., were in Ptolemy's time equally remote countries with East Africa, and by comparing them we find that his manner of description is always similar, inland itineraries only being given for special purposes. For instance, on the banks of the two Inner African rivers, Gir and Nigir, we find a series of stations, for the special purpose of describing in detail the course of these mysterious rivers. But in many instances in Africa and Asia, mountains, rivers, &c., are described by Ptolemy in a much shorter way, and yet the striking similarity of these features with our modern maps shows that this shortness is by no means due to want of authentic information, but simply to the well-known tabulary character of Ptolemy's work.

6. Marinus gives the position of the lakes which he mentions as being a little north of the promontory of Rhaptum, and states that a navigator, called Diogenes, had to sail from Aromata for twenty-five days in a southerly direction—having the African coast on the right—until he came to these lakes. In the face of this distinct information, it is impossible to identify these lakes with some small lakes not far from the Red Sea in the country of Afar—more than eleven degrees north of the equator, distant from Zanzibar in a straight line about a thousand miles, and the neighbourhood of which can only be approached by making a long sea journey in an opposite direction to that stated by Marinus. The further statement that "these were no doubt some of the lakes referred to by Marinus—they had found no place in Ptolemy's map, who appeared to have removed them bodily into the interior," seems to imply that Ptolemy committed an arbitrary act in placing his Nile lakes far in the interior. That this is not the case is stated by Ptolemy himself, and fully explained in my paper. I am surprised that of all the authors who wrote about the Nile problem, only Artemidorus is cited besides Ptolemy and Marinus, whilst Aristotle, Eratosthenes, Pliny, Seneca, and others are much greater authorities in this respect than Artemidorus is.

7. Up to the present time cinnamon has nowhere been discovered in East Africa, and the position of the country where it came from in antiquity is uncertain. A discussion on the interesting and yet entirely uncertain question of East African cinnamon is not within the limits of this paper, but I am in possession of conclusive proofs that the cinnamon country was by no means confined to the northern Somali coast. For instance, Mr. Ravenstein's principal authority, Artemidorus, plainly states that cinnamon is more abundant in places far in the interior.

8. It is not absurd that a tribe called "Rhapsii" live near the Mountains of the

Moon. The Greek merchants of antiquity who traded with the ivory caravans coming from the far interior to the coast, must have been struck with the equality of race and the similarity of language of such people coming from the interior, and the Bantu tribes on the coast. I can therefore see no reason for taxing Ptolemy with absurdity because he gives to a tribe in the interior the same name as the inhabitants of the coast bore.

9. It is another mistake to state that Ptolemy's map did not give us a single proper name besides the Mountains of the Moon and the Rhapsii, whilst in the regions where Mr. Ravenstein speaks about we find the following localities and tribes not merely mentioned, but their positions determined by Ptolemy, viz., Rhapta metropolis, the river Rhaptus, Azania, Maste mons, Maste oppidum, the Mastitae, the Nile Lakes, the course of the Nile, the Ethiopian cannibals, and Agisymba.

10. As I have already pointed out, Ptolemy himself tells us that his positions in East Africa south of the equator are uncertain as regards their geographical latitudes. Moreover he clearly explains that his Mountains of the Moon are situated in the same region where the Nile has its origin. These are well-known facts, and taking them into consideration, as must be done in every criticism, it is erroneous to say "that no snowy mountains existed in the regions in which they were placed by Ptolemy," especially after the discovery of the snow-capped Ruwenzori, which is the western source of the Nile. About itineraries I have spoken above, and as regards the Arabian geographers, all of whom wrote later than Ptolemy, I shall be pleased to discuss their views in full with Mr. Ravenstein at another opportunity. As regards the erroneous conclusion "that these Ptolemaic lakes were merely the well-known coast lakes shifted hypothetically into the interior, and connected with the Nile, whilst the only African snowy mountains known to the ancients were those of Semen in Abyssinia," I have clearly proved in this paper that this is impossible and in contradiction to all the statements of the ancient geographers, and I think I have given conclusive proofs that Mr. Ravenstein's explanation of Ptolemy's geography of Eastern Equatorial Africa is incorrect. There is no other explanation possible than that of identifying Ptolemy's Nile lakes and snow mountains with those discovered by the explorers of our century.

I cannot conclude without tendering my thanks to Mr. Ravenstein for the attention he has given to this paper, and also expressing my highest regard for him as a geographer.

The PRESIDENT :—The Geographical Society is usually occupied with the present, but it is exceedingly desirable that we should from time to time extend our researches also into the past. We could hardly have done so under pleasanter guidance than that we have had to-night from Dr. Schlichter. There is but one thing I regret, and that in common with Mr. Ravenstein, that Ptolemy is not here to-night to tell us precisely what he meant. As he unfortunately has not put in an appearance, I am afraid that after the very vigorous discussion to which we have listened, in which the thesis laid before us by Dr. Schlichter has been well smitten and well defended, most of us will be in the position in which I confess I am myself, that is one of suspended judgment; but I am convinced that you will all with one voice desire me to thank very particularly Dr. Schlichter, and also all the other gentlemen who have taken part in this discussion.

The Selkirk Range, North-west America.

By HAROLD W. TOPHAM.

Map, p. 576.

THE topography of the Selkirks is peculiar for the great similarity which one part bears to another. A glance at the map will show this.

The first thing which strikes one is the great resemblance between the Illecillewaet névé and that of the Deville Glacier. Both are of almost equal area, both lie north and south, and both are fringed alike upon the east by a row of small rock-peaks, which rise with an almost painful regularity of detail from out of the Beaver Valley below.

These peaks are by no means easy of access from the valley. They present at the summit a formidable array of precipitous rocks, which give place lower down to steep grass-slopes, and then to an almost impassable confusion of fallen timber and thick undergrowth. The huge trunks lie piled up one on the top of another, as though giants had been playing with them and tossing them about as a child would its game of spelicans.

From the top of the watershed at the foot of Beaver Glacier to Bear Creek the fall is about 1950 feet, and the distance about 30 miles. No great difficulty need be apprehended in the formation of road or railroad across the "Divide." The land at the top of the watershed is comparatively flat. Both glaciers, the Beaver and the Duncan, discharge their waters upon this Divide, the waters from the Beaver flowing north, and the waters from the Duncan flowing south into the Kootenay country.

We found upon the south side of Beaver Glacier a small dry river-bed running towards the Duncan Valley. In the spring, when the snows are melting rapidly, this river-bed is no doubt filled with water from the Beaver Glacier, and this water will then run into the Duncan river. When this happens, the Beaver Glacier supplies both sides of the watershed with water.

At the snout of Beaver Glacier there is a considerable amount of soft glacier mud, which renders access to the ice a little difficult.

The Beaver Valley is bounded upon the east by the Prairie Hills, an elevated plateau with an average of about 6300 feet. This plateau is covered with fair grazing grass, but is poorly watered. Between this plateau and the Columbia river are ranges of hills, higher certainly than the Prairie Hills, but yet possessing very few peaks of any importance. A fine valley runs east from the Prairie Hills.

Without revisiting the marks which I made, I am unable to state whether the glaciers are now advancing or retreating, but I am inclined to the belief that those which run west are advancing, whilst those running east and north are retreating. The Illecillewaet Glacier has

certainly retreated considerably since the Rev. Spotswood Green measured it in 1888.

There are many signs that the glaciers have at some period been of much greater extent than they are now. Upon the left side of the Dawson Glacier, for example, there are at least three old moraines, two of which are now covered with grass.

The Deville Glacier descends in a fine ice-fall into a circular valley, which we named Glacier Circle. It then makes a beautiful sweep at right angles to its course, and flows out of the valley between two high peaks which stand sentinel at the entrance to the valley. Glacier Circle is only a few miles in extent, and is enclosed by high peaks and buttresses of rock down which several glaciers and water-falls come tumbling. The rivulets emerge into a lake of about three-quarters of a mile in length, formed by the damming up of the main stream by the moraine and ice of the Deville Glacier. Like other glacial lakes, this one is sometimes full and sometimes nearly empty, according as the channel below becomes blocked or freed from ice. The waters from the lake, after passing beneath the glacier, find an outlet at its snout, and fall in a fine cascade into a cañon, through which they find a way into the Beaver Valley below. The motion of the glacier is very appreciable. When we first visited the glacier we found two remarkable boulders upon the moraine, which lies scattered on the surface of the ice. The upper boulder was poised on the top of the lower, and rested upon a few inches only of the lower, something after the style of the logan rocks of the Cornish coast. The measurements were as follows:—Lower boulder, 9 feet 6 inches high; upper boulder, 5 feet 8 inches high, 9 feet 4 inches long, 6 feet 10 inches wide. The overlap of the upper boulder on one side was 4 feet. These boulders could not have travelled far upon the ice in such a position. They must have been brought down into the glacier in a great avalanche of snow and rocks, and have been left in the position described when the snow melted away from around them. We first saw them in July. At the end of August they had both tumbled into a crevasse.

Between the Duncan Valley and the valley of the Lardo river there is a succession of snow-clad peaks and glaciers for a distance north and south of about 40 miles.

The glaciers of the Selkirks, though comparatively small, are very numerous, and the area which is covered with ice is large in proportion to that which is covered with snow.

Where in Switzerland we should find patches of snow, in the Selkirks we may expect to find ice. The great snowfall in the Selkirks may perhaps explain this. The pressure exerted upon the lower layers of the snow by the great depth of the snow which lies above them, tends to consolidate and to make into ice these lower layers.

Very few animals are met with. We saw a few bear and wolverines, a few mountain goats, the tracks of cariboo, and plenty of marmots.

There are besides a quantity of small animals to which the Indians give the name of *peezy*. These animals live either under or near some flat rock, upon which they place bundles of plants to dry in the sun. I have counted as many as twenty such bundles in one place. When dry, the bundles are carried underground and stored for winter use.

The great drawback to travelling in this range is the thickness of vegetation at the bottom of the valleys, and the difficulty of procuring men capable of acting as porters over a mountainous country. Until trails are cut not much advance can be expected in the survey of the country. When greater facilities are afforded, the Selkirks will no doubt become one of the most favourite places of resort to the numerous holiday-seekers of Canada and the States.

GEOGRAPHICAL NOTES.

Reported Disaster to the Crampel Expedition.*—Telegraphic news has been received in Paris from the Governor of the French possessions on the Congo, to the effect that M. Crampel and other members of his expedition have been assassinated, apparently by Mahomedan negroes, on their land journey from the northern bend of the Ubangi to the Baghirmi country. M. Crampel, who was some distance in advance, was the first victim; M. Biscarrat, who was behind at the headquarters, being subsequently murdered. One only out of the five Europeans of M. Crampel's staff is known to have escaped, bringing down the rear-guard to the French post on the Ubangi. M. Crampel was a young and enthusiastic pioneer in African travel and enterprise. He went out originally (in 1887) as private secretary to M. de Brazza, and in 1888 distinguished himself by his exploration of the unknown interior north of the Gaboon and the Ogowé as far as the boundary of the German territory of the Cameroons. An expedition, under M. Dybowski, is preparing to leave Brazzaville, on the Congo, with a strong force, for the scene of the disaster, and it is hoped that the papers and other property of M. Crampel may be recovered. A portion of the force has already proceeded to Bangui, the last French settlement on the Ubangi, situated a little below the Zongo rapids, whence M. Crampel started on his fatal march. M. Dybowski follows from Brazzaville at the end of the present month.

Mr. Joseph Thomson.—By telegram from Mozambique we learn that Mr. Thomson's second expedition to the interior beyond Lake Bangwaolo has been countermanded, and that he has left for England via the Cape.

Disaster to a French Expedition in Upper Guinea.—Information has reached the Geographical Society of Paris of the untimely fate of an

* Vide 'Proceedings,' *ante*, p. 484.

expedition led by Lieut. Paul Quiquerez and M. de Segonzac, which was attempting to penetrate into the interior along one of the rivers discharging into the Gulf of Guinea. The stream in question, the San Pedro, flows along the eastern frontier of the State of Liberia, and is but little known. At a distance of 125 miles from the coast the party was attacked by the negroes and their boat capsized in the rapids. Everything was lost. Lieut. Quiquerez succeeded in making his escape, only to succumb to a fatal attack of fever. It was not stated whether M. de Segonzac also lost his life.

Newly-discovered Crater Lake on Mount Cameroons.—In the course of an excursion to the north of the river Memeh, on the north-west side of Mount Cameroons, the well-known Swedish trader, M. G. Valdan, discovered in July last another lake basin, which in size is but little inferior to the Barombi or Elephant Lake. He named it, after the Governor of the Cameroons, "Soden Lake." It lies about 2300 feet above the level of the sea, and measures about $1\frac{1}{2}$ mile in diameter. There can be no doubt that this basin is of volcanic origin. Its outlet, the Mokundu, is a tributary of the Memeh.

Survey of the Black Mountain Country.—Captain R. A. Wahab, R.E., who was attached as survey officer to the last Black Mountain expedition, has accomplished a survey of 160 square miles on the 2-inch scale, covering the whole area in which military operations were carried on, and a good deal beyond it in the Chagarzai and Medakhel country. A reconnaissance of 300 square miles on the $\frac{1}{2}$ -inch scale, comprising all the ground within sight of any of the points reached, was also completed, as well as a large scale plan of Seri cantonments.

New Russian Expeditions to Central Asia.—Russian activity in the exploration of the unknown parts of Central Asia will be well sustained this year. Under the leadership of Captain Bachewski an expedition started on 29th May from Samarkand, with the object of exploring routes in the Pamir and the passes over the Hindu Kush into Kafiristan, thus supplementing the work which Captain Grombchevski has been doing in that region during the last two years. The latter traveller has himself returned to Turkistan from St. Petersburg.—M. Katanov will this summer explore the Tian Shan, principally in the interests of ethnography. He intends to travel by way of Urumtsi and Barkul to Hami, and spend the autumn in Turfan and the winter in Kuldja.—M. Tillo, President of the Mathematico-Geographical Section of the Geographical Society of Russia, is contemplating an expedition to the Turfan district, to examine the depression below the sea-level, discovered by M. Grum-Grjimalo.

The Causes of Chinese Emigration.—M. J. de Groot, a sinologue in the service of the Dutch Colonial Government in the East Indies, has made an interesting communication to the Geographical Society of

Amsterdam on the subject of Chinese emigration. According to the writer the causes of this emigration are not to be found in the excess of population, but simply in the poverty of the soil of the provinces whence these emigrants come. It is the bare, mountainous valleys of the eastern part of China which furnish the emigrants to the English, Spanish, and Dutch colonies; to California, Australia, and especially to Indo-China and Cochin-China. The prevailing formation of the ground in their native regions is granitic; the soil yields hardly anything, and the rainfall is slight. Potatoes and vegetables of very bad quality are the only food that can be extracted from the earth. In some favoured spots a little rice, but of a poor description, can be grown. Another cause of the emigration is disafforestation. Wood is very scarce and consequently very dear. Vegetation being almost entirely plucked up, the formation of a new layer of humus is absolutely impossible. The population of these regions is therefore compelled to seek subsistence in other countries. The writer is of opinion that as soon as China sets herself in earnest to construct a network of railways and to carry out other great works, the stream of emigration, which is causing so much anxiety in many parts of the world, will be stopped, as the people will find in the interior of their own country the work and means of livelihood which they now seek for elsewhere.

The International Geographical Congress at Berne.—The Congress of 1891, which held its meetings from the 10th to the 14th of August, was attended by over 500 members, or rather more than the Paris Meeting of 1889. This number included some of the best known geographers from all parts of Europe. Dr. Gobat, President of the Berne Geographical Society, presided during the meetings, supported by special presidents representing the various nationalities present. Many papers were read during the four days' meeting, and numerous committees appointed to consider various proposals that were made in connection with the subjects discussed. Probably the subject which created most general interest was the proposal by Professor Penck that the Congress should promote the construction of a map of the World on the scale of 1:1,000,000. A committee was appointed to consider the proposal and make suggestions to the general meeting. This committee consisted of M. Maunoir, Colonel Coello, Professor Guido Cora, Professor Penck, Colonel Lannoy de Bissy, Dr. Supan, and Mr. Scott Keltie. As the result of the recommendation of this Committee, the Congress decided to initiate the preparation of a map of the World on the scale of 1:1,000,000, and for the purpose created a commission composed of geographers and cartographers of different nationalities, who will endeavour to obtain the co-operation of the various governments, geographical societies, geographical reviews, and private geographical establishments. The Commission will indeed have to consider all the aspects of Professor Penck's proposal, including the question of its

practicability, and report to the next Congress. The Commission is composed as follows:—*Germany*, Dr. Supan, Baron von Richthofen; *Austria-Hungary*, General von Arbter, Professor Penck; *Spain*, Colonel Coello; *United States*, Major Powell, Mr. Mendenhall; *France*, M. Ch. Maunoir, M. François Schrader; *The British Empire*, General J. T. Walker, Colonel Sir Charles Wilson, E. G. Ravenstein, J. Scott Keltie; *Italy*, Professor Guido Cora, General Annibale Ferrero; *Portugal*, Professor Cordeiro; *Netherlands*, M. Eckstein; *Russia*, General Tillo; *Sweden*, Major Selander; *Switzerland*, Colonel Lochmann. Another Commission was appointed by the Congress to consider the question of universal time and the prime meridian; but it is understood that the decision of the Washington Congress as to the Greenwich Meridian will not be disturbed. A formal resolution was passed by the Congress repudiating the claims put forward by Mr. Glazier as to the discovery of the sources of the Mississippi, and awarding the honour to H. R. Schoolcraft, Lieutenant Allen and J. N. Nicollet (1832–1836). The Congress voted in favour of the system of spelling geographical names proposed by the Royal Geographical Society, though it is doubtful if the resolution will have much practical result. Among a variety of other resolutions was one (resulting from the proposals of Sir Erasmus Ommanney and Mr. Delmar Morgan) expressing a hope that the proposed Antarctic expedition would be organised as soon as possible. These are some of the more important resolutions passed by the Congress, to the general work of which we may make more detailed reference in the October number. The exhibition was an admirable one. A jury was appointed to make awards for the Educational Section, in which England was conspicuous by its absence. There were also sections devoted to a historical series of Swiss maps, and to the Alps. The exhibition filled many rooms in the new Federal Palace, and was well organised. In each section some of the best works in maps, reliefs, photographs, pictures, and appliances of various kinds, were on view; altogether the exhibition was probably the most instructive department of the Congress. A very distinct wish was expressed that the next meeting should be in London. It was resolved that in future the Congress should not meet oftener than once in every three years, nor less frequently than once in every five years; thus the next meeting will take place between 1894 and 1896.

PROCEEDINGS OF FOREIGN SOCIETIES.

Geographical Society of Paris.—May 1st, 1891: Vice-Admiral VIGNES in the Chair.

CAPTAIN MONTEIL'S JOURNEY IN THE REGION OF THE UPPER NIGER.

Commander de Lannoy de Bissy communicated a portion of a letter addressed to him by Captain Monteil from Samoroghana on 4th March, in which he stated that he had not found anything remarkable in the orography of the country. The ground only commences to rise after leaving Kumberi. One then enters the mountains of which Sikasso occupies one of the most eastern summits. At Sikasso the range takes an east and west direction, and gives rise to all the streams which flow into the Bani (Mayel-Balevel on the maps), an important tributary of the Niger. From Sikasso the mountains extend to the vicinity of Tenetu, and then bend to the south and shut off the affluents of the Upper Niger. Between Tenetu and Sikasso the range is crossed by two important rivers, the Baulé and the Bagoé; but it is none the less the real watershed of the region. To the north of Sikasso Captain Monteil followed this water-divide and found that all the valleys run in a general direction from south-east to north-east. The hypothesis of the Kong mountains must be rejected, inasmuch as the water-divide lies considerably to the north of the Kong country; but to say that this line of division is hardly recognizable is a mistake. The ground rises from about 1000 feet at Kumberi to 1500 at Sikasso, and there are isolated peaks reaching 2250 feet.

A JOURNEY UP THE RIVER TSIRIBIHINA (WESTERN MADAGASCAR).

M. Anthouard forwarded an account of a journey undertaken by him in conjunction with M. Cadière in the west of Madagascar, with the object of exploring the river Tsiribihina. The first part of the journey, viz. from Ambositra to Morondava, was accomplished without difficulty. The very hilly character of the country for the first half of the way renders the route an impracticable one; it would be necessary to make a détour to the south into the valley of the Mangoky, or to the north towards the Mania. Between the Bongolava chain of mountains, which forms the western declivity of the great central table-land, and the coast, extends an immense plain, inhabited by the Sakalava. This region is very fertile: the soil is light but rich. There vast prairies, covered with clumps of trees, abounding in game, and affording pasturage to large herds of wild oxen. Potatoes, manioc, and bananas thrive without cultivation. A great belt of forests, from 20 to 25 miles broad, lines the coast. Ebony trees and various rose-woods are abundant, while indiarubber is also found. At Morondava the travellers embarked on a small boat, and in two days arrived at the principal mouth of the Tsiribihina (there are five outlets), where there is a large village, the centre of a considerable trade. The river banks are more or less wooded, and the country fertile and well populated. The river is 1000 yards broad at its mouth, but at some distance inland it broadens. It is navigable, especially at high water, from November to March, as far as the Bongolava mountains. From Tsimia, the residence of the king, the travellers had to abandon their canoes, and proceed on foot along by the river under the guidance of a Sakalava escort. Above Tsimia the river flows through a low, marshy plain, where there are magnificent forests of rosewood; but the region is unhealthy, and the population scanty. On reaching a chain of low hills separating two plains, the river divides, one branch, the Mania, coming directly from the east; the other, the Mahajilo, from the north-east. Both these streams, 1000 yards broad, are navigable

for some distance. The first rapids of the Mahajilo are at the foot of the Bongolava mountains, and those of the Mania probably a little further east. Seven days' march from Tsimia brought the travellers to Imanandaya, the first Hova station, whence they made their way as quickly as possible back to the capital.

THE COUNTRY OF THE BATAKS (SUMATRA).

Some interesting information respecting the country of the Bataks was communicated by Dr. Meyners d'Estrey, who gave in summary the results a journey undertaken by M. C. J. Westenberg, the Dutch Governor of the east coast. The independent Bataks inhabit the lofty table-lands of the mountains, which traverse the great island from north to south. The country presents the appearance of an immense plain covered with grass and alangalang. The ground is not very undulating, but is traversed by numerous and deep ravines, along which run watercourses of small importance. The chief and almost the only product cultivated is rice; very few cattle were seen. The population, divided into a large number of little states, numbers about 60,000, the Kampongs or more important villages containing from 2000 to 3000 inhabitants. Gold and lead are found, and sulphur is obtained from the craters of the volcanoes.

— May 15th, 1891: Vice-Admiral VIGNES in the Chair.

EXPLORATION OF THE BLACK SEA.

M. Venukoff announced the departure of the new Russian expedition for the exploration of the Black Sea. The party, consisting of MM. Schindler, Androussoff, and Wrangel, is the same as was engaged in the exploration of last year, and the ship, the *Tchernomoretz*, is also the same; but the expedition will last double the time, and promises to be rich in scientific results.

NEWS OF TRAVELLERS IN ASIA.

A letter, dated 27th December, 1890, from Sa-chau, was read from M. Martin. M. E. Müller, writing from Tashkend, announced the arrival at that place of M. Dutreuil de Rhins and his companion, M. Grenard, on 7th April, and their departure, twelve days later, for Margilan and Kashgar.

THE BADOUJS OF JAVA.

The researches of Dr. Jacobs and M. J. J. Meyer have furnished new information regarding the Badoujs, who inhabit the virgin forests which clothe the mountains of the south of the province of Banten. There seems to be no doubt that they are the descendants of the ancient empire of Padjadjaran, which was overthrown by the Arabs towards the close of the fifteenth century. They have the strange custom of not allowing more than a given number of families in a village.

— June 5th, 1891: Vice-Admiral VIGNES in the Chair.

M. PONEL'S EXPLORATIONS ON THE RIVER MOBANGI.

A résumé of a letter, dated 19th December, 1890, was read, giving an account of several reconnaissances made by M. Ponel, who is in command of the station of Bangui on the Mobangi, in anticipation of the arrival of M. Crampel on his journey to the north. M. Ponel ascended with eleven men the rapids of Zongo, Langu-Belli, Bu-Mindi, Bwagha, and Makuangue in four days, and then arrived in the region of the great plains under 5° 11' 23" N. lat., and 18° 21' E. long. He surveyed three streams, the Umbella, a little watercourse flowing north, the Komo, which turns sharply to the north-east, and is more navigable than the Umbella, and the Kandja, which also bends to the east, but is of no importance. M. Ponel then made an excursion overland of about 60 miles to the country of the N'Dris, a

curious people living in the interior about twelve miles from the river. After the arrival of M. Crampel, M. Ponel made a reconnaissance overland to Dapa about forty miles from the river. He marched for five days across great plains to the country of the Gambiri, with whom he concluded a treaty. M. Crampel decided to adopt this route on the way to Lake Chad. On the 14th December MM. Crampel and Ponel were at Makobu.

DR. TEN KATE IN THE ISLAND OF TIMOR.

Dr. Ten Kate has made three expeditions from Koepang, on the Island of Timor, the first to the region known as Amarasi, the second to the island of Saman, and the third and most important, to the centre of Timor, which he reached from Atapupu on the north-west coast. The Belos, who inhabit this region, although related to the Timorians of the south, differ from them in several points. The yellow skin is dominant there; the people are robbers and warriors, and are somewhat wild. The central region is very mountainous. There are no great forests; the eucalyptus and the casuarinas are abundant. On the 13th March the Doctor made an ascent of the highest summit of the Dutch part of Timor, Mount Lakân (about 6500 feet), and collected a number of geological specimens. Dr. Ten Kate intended to return to Flores and subsequently to explore the Sonda Islands.

— June 15th, 1891:—M. QUATREFAGES DE BREAU, President of the Society, in the Chair.—This was a special meeting, held in the large hall of the Sorbonne, for the purpose of giving a reception to M. Henri Coudreau, on his return from his third journey in the interior of French Guiana.

M. COUDREAU'S EXPLORATIONS IN THE INTERIOR OF FRENCH GUIANA.

It was at the end of 1889 that the traveller found himself on the Lower Oyapock. The winter (January to July) of the year 1890 was occupied in ascending all the principal tributaries of the Upper Oyapock, which had hitherto been unexplored. The following were thus visited, the Motura, the Eurenpuçigne and Yingarari, the Yaué and the Yarupi. The banks of all these streams are deserted, their courses are obstructed by falls and traverse vast marshes. After a journey to the coast to get stores and provisions, M. Coudeau set out on 8th September on a circular route across the Tumuc-Humac Mountains and back along the valleys of the Upper Oyapock, Yary, Itany, and Appruague. Nine days were occupied in crossing the mountains. The country on the south side of the Tumuc Humac was inundated, owing to the almost daily rains, game was very scarce, but on descending towards the valley of the Yari the large quadrupeds of the country, maïpouris and capiaïyes, as well as peccaries, hoccas, and ducks, were met with in considerable abundance. The country is poor and compares unfavourably with the northern slopes of the Tumuc-Humac. Vegetation is scanty as the soil is all sand and marshes. The Rucuyeunes, the most important tribe of Central Guiana, are, however, numerous. They have 35 villages of from 25 to 50 inhabitants each. There are no outlets from this region to the north, in consequence of racial prejudices. From the Yari the traveller proceeded up the river Mapoany in order to reach the Eastern Tumuc-Humac. Like all the rivers of Guiana, the course of the Mapoany is obstructed by falls, rendering navigation to any considerable extent impossible. In the nine days occupied in ascending the Mapoany, 15 falls were passed. Again crossing the mountains, the travellers arrived in the valley of the Upper Itany, which forms the boundary between Dutch and French Guiana, and proceeded down the stream to its junction with the Inini, then along the latter river and down the Appruague to Cayenne, where he arrived on 27th January, 1891. M. Coudreau's surveys cover 3100 miles of country, 1550 miles of which are new, and 620 over

country hitherto quite unexplored. His journey has proved also most fruitful in ethnographical results.

Geographical Society of Berlin.—June 4th, 1891: Dr. REISS in the Chair.

DR. BASTIAN ON RUSSIA IN CENTRAL ASIA.

Dr. Bastian, Head of the Ethnological Museum of Berlin, read a paper on his recent travels in Central Asia, East Africa, East Indies, and Australia, which occupied eighteen months. The speaker upheld the opinion that the problems of civilisation, which are confronting Russia in Central Asia, will demand and absorb all her energies for centuries, the result being the good of all. "Eastward the sway of Empire takes its way." The Russian colonist remains in his home, although transported to the remotest boundaries of it, and the easy submissiveness of the Slav national character will serve here as the suitable medium for the assimilation and fusion of the peoples of Central Asia. As to the realisation of the bugbear of an invasion of India—the measures taken on the English side to prevent such an invasion were seen by the speaker himself in the course of his journeys in all directions through India—the Russians, in Professor Bastian's opinion, will not, on the grounds of prudence, attempt it, because the caste system of the Indian population would not harmonise in any way with their nature, while the aristocratic exclusiveness of the English government corresponds best with the conditions of society in India. But one cannot be blind to the fact that India has entered upon a critical stage of transition, since, through the opening of the Suez Canal, Europe has been brought so much nearer, and that the stability of manners and customs, which had remained unaltered for thousands of years, has received a shock from the introduction of a mass of foreign fermenting matter. The most effective levelling force is found in the railway which, even in the overcrowding of the trains, helps to break down the rigid caste distinction and brings a Brahman under certain circumstances into contact with a Pariah or Chandala. The variety of conditions in India, resulting from the manifold division of its peoples according to race, language, religion, and climate, presents an obstacle which must prove insuperable, for any measurable distance of time, to the national idea of "Young India."

ITALIAN MAPS OF THE MIDDLE AGES.

Dr. Kretschmer then read a report upon the studies and investigations, undertaken by him at the instance and cost of the Geographical Society, in the Italian libraries in search of still unknown cartographical material of the middle ages. The young savant was successful in discovering a large number of hitherto unknown so-called "wheel and compass maps," and these new acquisitions for the history of the cartography of the middle ages will be published by the Geographical Society in connection with the celebration of the 400th anniversary of the discovery of America.

— July 4th, 1891: Dr. W. REISS in the Chair.

LIEUT. MORGEN'S EXPEDITION INTO THE INTERIOR OF CAMEROONS.

Lieut. Morgen reported upon his journey from the Cameroons to the Benue. In the summer of 1889, Lieut. Morgen was appointed to take the place of Lieut. Tappenbeck, of the Cameroons expedition, who had just died; and subsequently, upon Captain Kund becoming unfit for service, Lieut. Morgen was obliged to undertake the command of the expedition. Although quite inexperienced in African travel, he succeeded in conducting the expedition safely through the dense virgin forest (nine days' march), in which the sun is never seen, and which divides the

Batanga coast from the interior; and also in penetrating to the north across the Sannaga to Ngila. From this point the traveller made an attempt to reach the Cameroons by a direct route to the west; but after he had discovered and crossed the great river Mbam, which flows from Adamaua, the opposition of a particularly warlike tribe, the Bati, prevented him from carrying out this plan. He was obliged to march along the now united course of the Sannaga and Mbam to the south-west, and thus reached the coast at Malimba along an entirely new route. On the 2nd June, 1890, Lieut. Morgen, in company with a trading caravan, started again from the Batanga coast, erected a new station at Ngila, and endeavoured to obtain the permission of this important ruler (Ngila) to advance further to the north. But after this permission had been continually refused on various pretexts, Morgen, taking advantage of the absence of the chief upon a warlike expedition, set out northwards alone, without guides, although he was at the time suffering severely from dysentery. After eight days of forced marching over a level grass-land, the traveller arrived at the first Tibati village, Joko. Here he was compelled to stop for five weeks, awaiting the permission of the ruler of Tibati to enter the country. The huts of the first Adamaua village also have the round pointed roof, but each plot of ground is surrounded by a hedge. Some of the natives speak Fulani, but the majority speak Wute. The latter language still prevails largely throughout the whole of Tibati, because the father of Ngila, and of his more powerful brother Nguta, who was the chief of all the Wute peoples, settled at an earlier date in this country; he was pushed southwards by the Fulahs only about fifteen years ago. The ruler of Tibati, Amalamu, who is still a very young man, entered about three years ago upon a war with the Domme, a tribe living at a distance of four days' march south-west of the capital Tibati, and he has never entered the capital since that time. On the 1st December Lieut. Morgen arrived at length at the military camp (numbering about 12,000 men) of this powerful chief, who received him in the most festive style. Among the festivities the displays of feats of horsemanship played an important part. On the 25th December the traveller set out once more, and making a great detour to the north-east, reached the Mbam, which, at that time, being the dry season, he was able to wade through on foot. From this point the journey was continued by way of Banjo and Gasheka to Beli and Bakundi. At Ibi the traveller, who was very short of means, received a most cordial welcome from the officials of the Royal Niger Company, with whose ready assistance he managed to reach Akagsa on the 7th February. According to the traveller's observations there can be no doubt that in the regions of Southern Adamaua, opened up by him for the first time, a fierce struggle for existence is going on among the various peoples living there. Upon the Jaunde tribes there are pressing from the south the Mpangwe. Upon the Mwelle, who inhabit the northern banks of the Sannaga, the Wute are pressing, and upon the latter in their turn, the Fulah. These conflicts are at the same time indicative of the struggle of Paganism with Mohammedanism. There appears but little room for doubt as to who will shortly come off victorious in this conflict, when one has seen the strength, discipline, and courage of the armies of Ngila, and of his brother Ngute. But they will also in their turn have to give place to the Fulah, who are advancing upon them. It is lamentable in the highest degree to see how the whole of this vast region is depopulated and devastated by the ever extending slave raids. The great rulers of Adamaua, the Sultans of Tibati, Banjo, Gasheka, and also of Jola, live exclusively upon the proceeds of these man-hunts, which are continually being extended to the south. The captured slaves are transported across the Benue to the great slave markets of Sokoto, Kano, and Kuka. This nuisance can only be put a stop to in co-operation with England.

JOEST'S TRAVELS IN GUIANA.

Prof. W. Joest then gave an account of his travels in Guiana. Guiana presents an excellent field of observation for comparing the results of the colonising efforts of five European nations, the Spaniards, English, Dutch, French, and Portuguese, in the various provinces of the country, which closely resemble each other in their geography and climate. Guiana, that part of north-east South America which has been known the longest, but is still the least explored, which has been endowed by nature with profuse liberality, but has been neglected by man in such an inexcusable manner, is decidedly one of the richest, most beautiful, and remarkable countries of the New World. Politically, it is divided into (1) Venezuelan Guiana, also called Estado Bolivar; (2) English Demerara, with Georgetown as its capital; (3) Dutch Surinam, with its chief town Paramaribo; (4) French Guiana, often called Cayenne, after its capital; and (5) Brazilian Guiana, which comprises parts of the provinces of Pará and the Amazonas. The political boundaries of these territories are still very uncertain and debateable. Tracts of country of over 15,500 square miles in extent are made the subject of contention. Thus for many years there has been a dispute between France and Brazil concerning boundaries. By the peace of Utrecht in 1713 the river Vincent Pinçon was laid down as the boundary line between the two colonies; but up till this day it has not been possible to determine what river is to be understood under this name. The Brazilians maintain that *de jure* the Oyapock should be considered as the boundary river, although *de facto* they have withdrawn from the contested territory as far as behind the Partarugal, and even the Araguay. The name of the only settlement on this coast, Cunani, has been in recent years often mentioned in the newspapers as the scene of different French and English private enterprises, the leaders of which aimed at acquiring rights of sovereignty in this country, at establishing factories and organising a cattle trade between the rich pastoral district and the rest of Guiana. The boundary dispute between Holland and France was settled some weeks ago by arbitration in favour of Holland. The Maroni is the boundary line between the two colonies; but this river is formed by two large streams of nearly equal size, the Tapanahoni and the Lawa. The Dutch maintained that the Lawa was the greater of the two branches of the river, and as such was to be regarded as the continuation of the Maroni; this was disputed by the French. The question was at first an acute one, inasmuch as in the territory lying between the two streams rich gold deposits had been discovered. The finding of further gold-mines in Venezuelan Guiana has led also to the boundary dispute between England and this Republic, in which the frontier of Demerara was pushed forward across the Essequibo to the west. Geographically, Guiana is divided into two parts, viz. the coast region and the highland, the western limit of which in Surinam is formed by the still almost totally unexplored Tumuc-Humac Mountains; in the interior of Demerara there are mountains which, like Roraima, rise to a height of 8000 feet. The highland is for the most part covered with virgin forests, inhabited by isolated Indian tribes, who have no communications with the natives living in the neighbourhood of the coast, because between the two the bush negroes have established themselves, and they, in their own trading interests, prevent any intercourse. The wonderfully fertile alluvial tracts of the coast were years ago occupied by European settlers, who, after felling the virgin forest, formed sugar, coffee, cocoa, and cotton plantations. The enormous profits which were made here up to the time of the abolition of slavery, are simply incalculable. These plantations occupy in Demerara a narrow belt of country following the coast-line, while in Surinam near the sea-coast the banks of the mighty rivers have also been brought under cultivation by the colonists. The

planters have to protect themselves particularly against two enemies; in the first place against the sea, which at high tide rises almost everywhere higher than the fertile coast border of Guiana, and then against the volume of water which rushes down from the more elevated lands in the interior during the rainy season. Those master-hands in the construction of waterworks, the Dutch, have succeeded in protecting their plantations against the inroads of the sea, and of the floods from the interior by means of dikes, many miles in length; and by a clever system of sluices the irrigation and drainage of the lands under cultivation are regulated. The whole life and prosperity of the inhabitants of Guiana is dependent on the ebb and flow of the tide. It must not be forgotten that there are in Surinam, for instance, with the exception of the immediate vicinity of Paramaribo, no roads or tracks, but that all intercourse is carried on along the waterways, and this in a country where all the rivers flow up-stream for twelve hours daily, and where the difference of the water-level of most of the rivers between the lowest point at the ebb in the dry season and the highest point at the flood in the rainy season, at the place where the waters are dammed up (from 30 to 40 miles from the river's mouth), exceeds 33 feet, and on the Orinoco 66 feet. After the annexation of Demerara by England, the latter country completed the system of dykes and canals constructed by the Dutch, by a massive stone embankment, which is a magnificent piece of work. The prodigious quantity of soil which is carried down to the sea every year in the season of the rains by the mighty rivers has caused the formation along the whole coast of sand- and mud-banks; the water is often of the colour and consistency of pea-soup, and without the assistance of a clever pilot it is impossible at high tide to find the frequently changing and narrow channel into the mouth of a river many miles broad. There is consequently scarcely a more desolate picture than that presented by the coasts of Guiana with their mud-banks gradually increasing and rising above the sea-level. At Port Coronie, for example, which was formerly the shipping port for numerous plantations, and where a large number of steamers used to unload, the effect has been such that to-day the bags of cocoa, and economical travellers also, are pushed by negroes as far as possible over the mud-banks of the coast on broad boards like sledges, and are then carried on the shoulders of the negroes, who wade up to their hips in mud, to a small boat which conveys its load to a schooner anchored in the mud far away from the coast, where passengers are compelled to wait, without regard to wind and weather, for one of the small steamers which do the carrying trade between Surinam and the places on the coast. Surinam is the only country which can be designated a Jewish colony in the same sense as Australia is an English one. In the small Parliament, which has been in existence since 1866, there are thirteen Jews out of the fifteen members. The Surinam Jews are descended mostly from those Portuguese-American Jews who were driven out of Brazil in 1644, and who came by way of Cayenne to Surinam, and were hospitably received there. Even in 1694 these settlers possessed forty plantations, while in 1750 the number had grown to 115, with 9500 slaves. Upon the abolition of slavery in 1863 the majority of the Dutch owners of plantations were content with the money (300 guilders = 25*l.*), which was paid to them by the Government for each freed slave, and either sold their possessions for a trifling sum or simply abandoned them. Thereupon Surinam sank into a sleep, out of which it has not yet awakened. In all directions are seen abandoned plantations and the ruined walls and roofs of factories. The Jews, however, did not then leave their adopted country. They remained, bought for a mere nothing the forsaken plantations, divided them into small lots, and then either sold or leased them to the freed negroes, who up to the present time maintain a poor, wretched, but nevertheless free existence. The result is that the whole population of this fertile country, which is

traversed by magnificent rivers abounding in fish, lives, with the exception of bananas, exclusively upon imported American cod-fish, salt meat, and rice. How totally different is the state of affairs in Demerara, which is to-day one of the most flourishing of England's colonies! Here there are 115 sugar factories, which in spite of unfavourable circumstances yield a very considerable profit, while in Surinam, where sixty years ago there were 188 factories, there are now only eight, three of which belong to an Englishman, and in Cayenne there exists only one such factory, which is the property of the French Government, and requires every year a considerable subsidy of money. In 1848 thirty sugar factories were in full operation here. In Demerara a line of railway, about 21 miles in length, connects the district of the plantations with Georgetown, where eight newspapers are published, and where there are eleven more or less good hotels. The city is lighted with gas, has a proper water supply, telephone system, docks, a magnificent botanical garden, race-courses, &c.; whereas in Surinam the authorities are proud of their achievement in lighting the streets with petroleum lamps on moonlight nights. Georgetown had in 1890 a population of 53,450, and Paramaribo one of 27,750. The climate of Guiana is, speaking generally, much better than its reputation. Georgetown has, it is true, to suffer sometimes from fever imported from the West Indies, but otherwise the mortality is not higher than in many of the large cities of Europe. According to the official statistics, the death rate in 1890 was 27.2 per 1000, and in Paramaribo 32.

NEW GEOGRAPHICAL PUBLICATIONS.

(By J. SCOTT KELTIE, *Librarian R.G.S.*)

EUROPE.

Baedeker, K.—Belgium and Holland. Handbook for travellers, with 13 maps and 20 plans. Tenth edition. Leipsic, Karl Baedeker; London, Dulau & Co., 1891: 12mo., pp. lxii. and 406. Price 6 marks. [Presented by Messrs. Dulau & Co.]

— The Eastern Alps, including the Bavarian Highlands, Tyrol, Salzburg, Upper and Lower Austria, Styria, Carinthia, and Carniola. Handbook for travellers, with 34 maps, 9 plans, and 7 panoramas. Seventh edition. Leipsic, K. Baedeker; London, Dulau & Co., 1891: 12mo., pp. xxii. and 504. Price 8 marks. [Presented by Messrs. Dulau & Co.]

Toynbee, [Capt.] Henry.—Weather Forecasting for the British Islands by means of a barometer, the direction and force of wind, and cirrus clouds. London, E. Stanford, 1890: 12mo., pp. iv. and 36. Price 2s.

The object of this little manual is to explain how a careful observer in any part of the British Islands, who will regularly write down at certain hours the readings of the barometer, the direction and force of wind, and the motion of cirrus clouds, may generally form a very good judgment of coming wind and weather. It is illustrated with a series of diagrams.

AFRICA.

[**Antananarivo Annual.**]—The Antananarivo Annual and Madagascar Magazine, edited by the Rev. J. Sibree and Rev. R. Baron. No. xiv., Christmas, 1890 (Part 2 of vol. iv.), Antananarivo. London, J. Haddon & Co., 1890: 8vo., plate.

This number contains, among other things, "A Malagasy Forest," by Rev. R. Baron; "Extracts from the Journal of Dr. Rutenberg" (translated from the German by Mr. Scott Elliott, M.A.); and "The River Antanambalana," by L. H. Ransome.

James, F. L.—The Unknown Horn of Africa; an exploration from Berbera to the Leopard river. The map based on surveys by W. D. James and Percy Aylmer, and the narrative illustrations by Rose Hake. Second edition, containing the narrative portion and notes only. London, G. Philip & Son, 1890: 8vo., pp. xx. and 273. Price 7s. 6d. [Presented by the Publishers.]

The first edition of the present work was published in 1888 and noticed in the 'Proceedings' for 1889, p. 120. The present edition contains an obituary notice of the author, by J. A. James and W. D. James.

Leared, Arthur.—Marocco and the Moors; being an account of travels, with a general description of the country and its people. Second edition. London, Sampson Low & Co., 1891: 8vo., pp. xv. and 345, map and illustrations. Price 16s. [Presented by the Publishers.]

The first edition of this work appeared in 1876. The present edition contains an introduction by the late Sir Richard F. Burton, K.C.M.G.

AMERICA.

[**America, United States.**].—Engineer Department, U.S. Army. Report upon United States Geographical Surveys West of the One Hundredth Meridian, in Charge of Capt. Geo. M. Wheeler, under the direction of the Chief of Engineers, U.S. Army. Vol. I.—Geographical Report. Washington, Government Printing Office, 1889: 4to., pp. 780. [Presented by Captain G. M. Wheeler.]

This is the final volume of the series of quarto Reports which embody the results of the United States Geographical Survey West of the One Hundredth Meridian. The present volume—Vol. I., only issued in 1889—contains the geographical results of the Survey. Other volumes of this series devoted to special subjects were issued as follows:—Vol. II. Astronomy and Barometric Hypsometry, issued in 1877; Vol. III. Geology, in 1875, Supplement, in 1881; Vol. IV. Paleontology, in 1877; Vol. V. Zoology, in 1875; Vol. VI. Botany, in 1878; Vol. VII. Archaeology, in 1879.

The origin of the survey, it is stated, was the outgrowth of a permanent and legitimate want of the War Department for current topographic information of the vast area west of the Mississippi, within which constant military movements were and are required. It was in a measure a continuation of such disconnected topographic works as the War Department had begun to prosecute for special objects prior to the war of the rebellion, and which were resumed at the headquarters of the military divisions and departments at the close thereof. It added to all existing data a complete survey, commencing with initial astronomic and geodetic points, with added topographic and hypsometric details upon which the orographic chart was based, thus forming a connected detail map of the region, suitable for all purposes, for not less than fifty years.

The area within the United States west of the one hundredth meridian of longitude (1,443,360 square miles) embraces, entire, the basins of the Colorado (270,000 square miles), Interior (208,600 square miles), Coast (100,900 square miles), and Sacramento (64,300 square miles); also, that part of the Columbia (215,700 square miles), south of the forty-ninth parallel, and portions of the basins of the Missouri (338,200 square miles), Rio Grande (123,000 square miles), Arkansas (75,500 square miles), Brazos (34,800 square miles), and the Red River of the North (3360 square miles). Of the above approximation 993,360 square miles is of a mountainous structure, the many ranges surrounding interior plateaux and valleys, while the remainder (450,000 square miles) is composed of the "mauvaise terre" of the northern, "plains" of the interior, and the "staked plains" of the southern latitudes. The approximate average elevation above sea of the total area west of the one hundredth meridian is approximately 4225 feet, the volume of the mass above this level being 1,155,201 cubic miles, while the approximate average altitude of the area of 359,065 square miles covered by the survey is approximately 5000 feet, or corresponding to a volume of 340,024 cubic miles. The approximate number of Indians (pueblos and nomads) within the area of survey was found to be 60,000,

belonging to not less than thirty-three distinct tribes. The white population therein, approximately, according to the census of 1880, was 631,067. Of the different industries, mining takes the lead, except in the States of California and Oregon, where agriculture has reached a distinctive status.

A summary of the work accomplished by the various expeditions in connection with the survey may be of interest. The expedition of 1869 traversed an area of (approximately) 24,428 square miles, including 24,028 square miles in south-eastern Nevada and 400 square miles in western Utah. The basins explored and mapped were southern portions of the "Great Interior," and central parts of the Colorado, north and west of the great southern bend. The expedition of 1871 traversed and examined an area of approximately 72,250 square miles, including 18,811 square miles in Eastern California, 29,600 in North-western and Central Arizona, 23,039 in Southern and South-western Nevada, and 800 square miles in Southern Utah. The basins of drainage, entered, traversed, and mapped, were central portions of the "Great Interior," and of the Colorado of the west. The area embraced by the work of the expedition of 1872 approximates 47,366 square miles (Arizona 11,766, Nevada 5384, and Utah 30,252 square miles.) It lies for the larger part within the Great Interior Basin, the balance belonging to the central portion of that of the Colorado of the west. The principal cañons within the area are the Grand, Marble, and Iceberg, of the Colorado of the west, the Kanab, and Paria, of its northern tributaries, the Provo, &c. The area entered during 1873 aggregates approximately 72,500 square miles, distributed as follows: Arizona, 20,175; Colorado, 19,892; New Mexico, 28,632; and Utah, 3801 square miles. The main body of the expedition operating from Santa Fe, New Mexico, confined its labours to the basins of the Rio Grande, de Chelle, Little Colorado, Gila, San Francisco, and Salt rivers, and the numerous creeks entering them, especially about the sources of the four latter streams. The expedition of 1874 covered an aggregate area of 23,281 square miles, distributed as follows: Arizona, 275; Colorado, 3600; New Mexico, 19,040; and Utah, 366 square miles, and found in the basins of the Rio Grande, Gunnison, Arkansas, Chama, Cimarron, Mora, and Canadian rivers. The operations of the season of 1875 embraced (approximately) 39,169 square miles, topographically surveyed—California, 19,545; Colorado, 6216; and New Mexico, 13,408 square miles. The Californian division made their examinations principally in the basins of the Colorado and Sacramento rivers; the Colorado section in portions of the Upper Arkansas, Rio Grande, headwaters of the Pecos, the San Juan, and Uncompahgre. The area embraced during 1876 aggregates 21,044 square miles (California, 9550; Nevada, 6700; Colorado, 750; and New Mexico, 4044), and lies in the basins of the Arkansas, Pecos and Rio Grande for the Colorado portion, and in the valleys of tributaries to the Upper Sacramento and Humboldt, Carson and Walker rivers of the Great Interior Basin. The area of the season's work in 1877 aggregated 32,477 square miles distributed as follows: California, 6825; Colorado, 3825; Idaho, 8877; Nevada, 3066; New Mexico, 6303; Utah, 3350; and Wyoming, 231 square miles. This area falls within the basins of the Upper Sacramento and its tributaries and the Great Interior Basin at the west, the Great Salt Lake Basin, and those of Bear and Snake rivers in the centre, and the basins of the Gunnison, Arkansas and Rio Grande in the eastern section. The area mapped by the expedition of 1878 aggregated 26,550 square miles (California, 10,175; New Mexico, 8625; Oregon, 7600; and Texas, 150 square miles. The main basins entered were the Columbia, Great Interior, Sacramento, Coast, Mohave, Great Salt Lake, Rio Grande, Pecos, and portions of the Gila. The expedition of 1879 was planned with the purpose of reviewing certain areas entered in 1873-75-77, and 78, in Atlas sheets 56 D, 61 B, and 52 D, and for the completion of the Salt Lake survey and concluding of the special geological examination of the mountain range southwards from the Spanish peaks to the southern extremity of the Santa Fe range. The basins of drainage embracing the season's doings are the Rio Grande, Arkansas, Colorado of the west, Great Salt Lake, and Sacramento.

The report is illustrated with a number of minutely detailed maps besides a

series of handsome illustrations, some of which are coloured; and the whole work is an important contribution not only to the geography, but to the geology, botany, and natural history of the region embraced.

Bristowe, Lindsay W.—The Handbook of British Honduras for 1891-92, comprising Historical, Statistical, and General Information concerning the Colony. Edinburgh and London, W. Blackwood and Sons, 1891: 8vo., pp. xiv. and 268, map.

Thomas, Herbert T.—Untrodden Jamaica. Kingston, Jamaica, A. W. Gardner & Co., 1890: pp. 90. [Presented by the Author.]

In this little volume the author has reproduced certain articles which he has contributed to various journals, and added to them hitherto unpublished accounts of his exploration of the little-known John Crow Mountains, and a ten days' expedition over the peaks and along the main ridge of the Blue Mountains. The John Crow Mountains are situated in the eastern part of the island, and may be said to be an off-shoot from the great central range. From Port Antonio, on the north side, they run south-east to within a few miles of Bath, then make a sharp turn due east, forming the northern boundary of the alluvial plain known as the Plantain Garden River District, and terminating in the sea at Quaw Hill.

The author, who claims to be the first man to cross this range of mountains, sums up the result of his exploration as follows:—"The highest point of the John Crow mountain range is 3355 feet above sea-level. On its western side the ridge preserves nearly the same altitude for four or five miles, falling away very precipitously into the valley of the Rio Grande. At its south-western angle, and immediately below this highest point, a low ridge connects it with that portion of the Blue Mountains known as the Cuna-cuna. The south side is also precipitous in its upper parts, and descends abruptly into the Plantain Garden River plain. On the north-east side it slopes away gradually into a well-defined valley that runs, roughly speaking, from a little to the north of Manchioneal nearly up to the north-east point, between which and the sea there is a large hill, or succession of hills, that protect the lower slopes of the mountain in that direction. On the north side the range breaks off into a series of cross ridges, intersected by narrow valleys of the purest virgin vegetable mould, covered with wild ginger and good timber, and amply protected by the ridges between which they lie. The highest part of the range is an undulating plateau of honeycomb limestone rock, bristling with cockpits, and overgrown with mangrove scrub and stunted tree-ferns. This plateau has a gradual slope to the north-east, and at an elevation of 2500 feet the flow of decomposed vegetable matter from above has accumulated so as to form soil of sufficient depth for good timber to find a footing, although water percolates very rapidly. This evil is obviated by the excessive rainfall; but even down to the coast the river-courses are never quite full, except in seasons of continuous rain; they only accumulate water in certain spots, such as 'Cudjoe Hole.'"

The volume contains a map, besides a series of illustrations from the author's own sketches.

Thwaites, Reuben Gold.—The Colonies, 1492-1750. London, Longmans & Co., 1891: 12mo., pp. xviii. and 301. Price 3s. 6d. [Presented by the Publishers.]

This forms the first of a series of three volumes, entitled 'Epochs of American History,' under the editorship of Dr. Albert Bushnell Hart, of Harvard College. In this series both physical and political geography are to receive special attention, and each volume is to be illustrated with maps. The present volume, covering the period between 1492 and 1750, gives in a compact form a history of the early English colonisation of America. It commences with a chapter descriptive of the Land and the Native Races, followed by others dealing with—Discoveries and Early Settlements (1492-1606); Colonisation and the Colonists; the Colonisation of the South (1606-1700); Social and Economic Conditions in the South in 1700; the Colonisation of New England (1620-1643); New England from 1643 to 1700; Social and Economic Conditions in New England in 1700; the Colonisation of the Middle Colonies (1609-1700); Social and Economic

Conditions in the Middle Colonies in 1700; other English North American Colonies (1605-1750); the Colonisation of New France (1608-1750); the Colonisation of Georgia (1732-1755); the Continental Colonies from 1700 to 1750. Each chapter is provided with a Bibliography for the use of teachers and others who wish to supplement the book by additional reading or study.

OCEANIA.

Codrington, R. H. [D.D.]—The Melanesians: Studies in their Anthropology and Folk-lore. Oxford, the Clarendon Press, 1891: 8vo., pp. xv. and 419. Price 16s. [Presented by the Publishers.]

The author, during his many years' connection with the Melanesian Mission, had exceptional opportunities afforded him of studying the inner life of the people. The results of his observations he has embodied in the present volume. The introductory chapter treats, among other things, of the various groups of Melanesian Islands; their connection, east and west; discovery; the names of islands, native and geographical; identification; geology; volcanos; coral; reef islands; lakes; waterfalls; zoology, &c. The bulk of the volume is descriptive of the people under various aspects, including their social regulations and conditions, customs, religious beliefs, arts of life, folk-lore, &c. There are a number of illustrations, and a map of Melanesia, which is poor.

Hort, Dora.—Tahiti, the Garden of the Pacific. With frontispiece. London, T. Fisher Unwin, 1891: 8vo., pp. 352. Price 10s. 6d. [Presented by the Publisher.]

Mrs. Hort's visit to the Society Islands was apparently made many years back. Her volume, however, conveys a good impression of Tahiti and Tahitian customs.

AUSTRALASIA.

Pugh's Almanac and Queensland Directory for 1891. Brisbane, Gordon & Gotch, 1891: 12mo.

A map of Queensland, compiled from official maps, accompanies the present work.

GENERAL.

Bulletin de la Société de Géographie. Septième série—Tome XII. 1^{er} Trimestre 1891. Paris, 1891: 8vo.

This number contains, among other things, an account of a Mission to Tademaït, January, February, March, 1890, by F. Foureau, illustrated with a map; on the Niger, Lake Deboe, currents and risings of the Niger, by G. Jaime; and Notes on 53 tribes of Guiana, by H. Coudreau.

Gibbins, H. de B. [M.A.]—The History of Commerce in Europe. London, Macmillan & Co., 1891: 12mo., pp. viii. and 233. Price 3s. 6d. [Presented by the Publishers.]

This work is, Mr. Gibbins believes, the first attempt in English to present a connected account of the progress and development of commerce, not only in England but in Europe, from antiquity to the present time. It is to be regretted that the author has not brought into more prominence the important bearings of geography on the subject—the influence of geographical conditions on the development of commerce—as it is, however, the volume will be of service as giving a general outline of commercial progress. The opening chapters contain a short sketch of the commerce of the ancients, including the Phœnicians, Carthaginians, Greeks, and Romans, followed by others treating of mediæval commerce, under the following headings:—The barbarian invasions and the decay of commerce, the revival of commerce in the Middle Ages, the Italian cities, the Hansa towns, mediæval trade-routes and fairs, the manufacturing centres of Europe, and the commerce of early and mediæval England. In dealing with Modern Commerce, the author treats of the commercial empires in the east, the commercial empires in the west, English commerce from the sixteenth to the eighteenth century, European commerce in the seventeenth and eighteenth centuries, the industrial revolution in England and the Continental war (1793),

modern English commerce, modern Europe, France and Germany, Holland, Russia, and the other states. A series of questions on the subjects discussed are given at the end of the volume. There are also appendices showing the comparison between the exports of British produce and manufactures of to-day and those of fifty years ago, and a table of the colonies and dependencies of European Powers, with the area and population of each. There are also a number of maps illustrating the subject.

Slack, [Capt.] C.—*Tourist's and Student's Manual of Languages*; including French, German, Italian, Spanish, Portuguese, Dutch, Danish, Norwegian, Swedish, Russian, Polish, Hungarian, Roumanian, Welsh, Latin, Modern Greek, Arabic, Turkish, Persian, Hindustani, Chinese, Japanese. Also, *How to Learn a Language*; Pronunciation; Money and Exchange Table, &c. Fourth edition. London, Simpkin, Marshall & Co., 1891: 12mo., pp. 128. Price 2s. 6d. [Presented by the Author.]

The object of this little "Manual" is to place in the hands of the tourist, traveller, or student, a hand-book of useful words and sentences, which shall enable him at short notice or with limited study to make himself understood in the countries he visits. The various alphabets are also added so that the pronunciation may be easily acquired, while the vocabularies and sentences are so arranged as to be available for immediate reference.

NEW MAPS.

(By J. COLES, *Map Curator R.G.S.*)

ASIA.

Indian Government Surveys.—India, showing the principal River Basins. 1 inch to 96 miles. Prepared for the Calcutta International Exhibition, 1883.—Sketch Map of India, showing Financial Circles and Lines of Inland Customs, 1874. 1 inch to 32 miles, 6 sheets.—India, 1 inch to 64 miles, 1891. 2 sheets (Sketch Map).—India, showing Missionary Stations. 1 inch to 64 miles, October, 1884. 2 sheets.—North-West Provinces and Oudh Survey. 1 inch to a mile. Sheet No. 36, Districts Aligarh, Etah, and Muttra. Seasons 1871-73 and 1883-84. No. 53, Districts Aligarh, Etah, and Mainpuri. Season 1883-84. No. 198, District Mirzapur. Seasons 1881-83 and 1886-88. No. 207, District Gorakhpur (with overlap in District Azamgarh). Seasons 1883-87. No. 208, Districts Gorakhpur and Ballia (with overlap in District Azamgarh). Seasons 1874-76 and 1885. No. 148, Districts Bara Banki, Bahraich, and Gonda. Season 1863-69. No. 149, Districts Bara Banki, Gonda, and Fyzabad. Seasons 1863-69. No. 151, Districts Sultanpur and Rae Bareilly. Season 1862-65.—Central India and Rajputana Survey. 1 inch to a mile. No. 220, Part of Bikaner (Rajputana). Season 1867-68. No. 221, Part of Bikaner (Rajputana). Season 1867-68. No. 224, Part of Shekawati (Rajputana). Season 1867-68. No. 254, Parts of Shekawati and Bikaner (Rajputana). Seasons 1866-67-68. No. 256, Parts of Shekawati and Tonrawati (Rajputana). Seasons 1865-66-67.—Punjab Survey. 1 inch to a mile. Sheet No. 294, Districts Umballa and Karnal (Preliminary Edition). Season 1887-88. No. 315, District Umballa and Kalsia State. (Preliminary Edition). Seasons 1886-87-88.—Bengal Survey. 1 inch to a mile. No. 362, District Mymensingh. Seasons 1850-55.—Assam Survey. 1 inch to a mile. No. 39, Districts Kamrup and Darrang. (Preliminary Edition.) Seasons 1883-87.—Lower Burma Survey. 1 inch to a mile. No. 278, Districts Hanthawaddy and Tharrawaddy. Seasons 1880-84.—South

Eastern Frontier. 1 inch to 4 miles. No. 1 S.E. (4th edition). Parts of Upper and Lower Chindwin, Pakokku, Yè-û, Shwebo, Mandalay, and Sagaing Districts (Upper Burma). Seasons 1886-90. No. 4 S.E. (2nd edition). Parts of Shan States of North and South Theinni (Senwi) and Kyithi-Bansam. Seasons 1887-89. No. 4 N.W. (3rd edition). Parts of Katha, Bhamo, Ruby Mines, Swèbo and Momeit (Möngmyit). Districts (Upper Burma) and Shan States of Mongmow, North Theinni (Senwi) and Taungbaing (Loi Lōng). Seasons 1888-90. No. 5 S.W. (4th edition). Parts of Meiktila, Yamèthin and Pyinmana Districts (Upper Burma) of "the Myelat" and of the Shan States of Nyaunggywè (Nyonghwè), Bawnin, Thigyit, Lwelôn (Loilom), Saga (Samka), Hopôn, Nankôk, Naungmum, Banyin, Thatôn (Santôn), Maingpun (Möngpwan), Maingeik (Möngsit) Monè (Möngnai) Maukmè (Mokmai), and Lègya (Laika). Season 1886-90. No. 5 N.W. (4th edition). Parts of Mandalay, Sagaing, Myingyan, Meiktila, and Kyauksé Districts (Upper Burma) of "the Myelat" and of the Shan States of Ywangan, Yatsauk, (Loksok), Maingpyin, Mone (Möagnai), Lègya (Laika), Maing Kaing (Möng Kōng) Kyithi-Bansam (Kisi Mansam), Maingtôn, and Shan States of Thibaw (Sipaw). Season 1889-90.—Map of the Presidency Division, comprising the Districts of Moorsshedabad, Nuddea, Jessore, Khoolna, and 24-Pergunnahs, with Sundarbans. 1 inch to 8 miles. 1890.—The North-West Provinces and Oudh, under the jurisdiction of the Lieut.-Governor, corrected to 31st March, 1890. 1 inch to 32 miles.—District Durrung (Assam Revenue Survey) 1871-74. 1 inch to a mile. 11 sheets.—District Monghyr. 1 inch to 4 miles. Additions and corrections to September 1889.—District Lakhimpur, Assam. 1 inch to 4 miles. Additions and corrections to May 1890.—District Jalpaiguri and the Native State of Cooch Behar. 1 inch to 4 miles. Additions and corrections to April 1890.—District Ghazipur, 1878-82. 2 inches to a mile. 2 sheets.—District Dacca. 1 inch to 4 miles. 1885. With additions to Boundaries and correction of Railway. (*Stanford, Agent.*)

AFRICA.

Maidment, Charles.—The first published Geological Map of the Gold Fields, Witwatersrand, South Africa, by Charles Maidment, Geological Surveyor. Scale 1:37·239 or 0·51 geographical mile to an inch. With a pamphlet. Cape Town, The Argus Printing and Publishing Company (Limited). 1890. (*Dulau.*)

This map contains a large amount of valuable information with regard to the geology and topography of the Gold Fields of Witwatersrand, Transvaal. It shows the auriferous belt of the conglomerate formation, and the names of the farms through which it runs. In addition to the principal map, several sections are given, and it is accompanied by a pamphlet containing explanatory notes.

Zambeze.—Carta do Delta do — e Terrenos Adjacentes por Affonso de Moraes Sarmiento Capitão d'Engenharia. 1891. Scale 1:500,000 or 6·8 geographical miles to an inch. Comissão de Cartographia. Lisboa. (*Dulau.*)

On this map are shown the proposed lines of railway from Quilimane to the Shire river, and the extensions at either end. A section of the country along the proposed line is given, with notes on the geographical formation, and in addition to the principal map, there are plans of the rivers Inhamissengo, Quilimane, and Chinde.

AMERICA.

Brazil.—Karte von Süd-Brasilien mit Angabe der Eisenbahnen von H. Lange. Scale 1:5,250,000 or 72 geographical miles to an inch. Berlin, W., 1891. Simon Schropp'sche Hof-Landkarten-Handlung. (J. H. Neumann.) Price 1s. 6d. (*Dulau.*)

AUSTRALIA.

Australia.—Map of —, constructed and engraved by W. and A. K. Johnston, Edinburgh and London, 1891. Scale 1 : 3,400,000 or 47 geographical miles to an inch. Price, coloured (with handbook), on rollers, varnished, 12s.

This map is drawn in a bold style, well calculated for use in schools. The colouring is well chosen, and the importance of towns, as regards population, is indicated by a system of symbols, capitals being underlined. All means of communication by railway, telegraph, and water, are laid down, and inset plans of the country in the vicinity of Melbourne, Adelaide, and Sydney are given.

CHARTS.

Admiralty.—Charts and Plans published by the Hydrographic Department, Admiralty, May and June 1891.

No.		Inches.	
1202	m =	3·0	Scotland, west coast :—Loch Dunvegan. Loch Snizort, 2s. 6d.
1626	m =	12·0	England, east coast :—Blyth, 1s. 6d.
1671	m =	6·0	Mediterranean, Archipelago :—Port Sigri, 1s. 6d.
1661	m =	2·45	Mediterranean, Archipelago :—Port Moudras (Porto San Antonio) and Port Kondia, 2s.
1617	m =	3·8	Mediterranean, Asia Minor :—Vourlah Road, 1s.
1603	m =	4·5	Mediterranean, Asia Minor :—Marmarice harbour, 2s.
1618	m =	4·55	Mediterranean, Asia Minor :—Karaghatch harbour, 1s. 6d.
846	{m =	2·7}	Mediterranean, Cyprus :—Limasol. Larnaka, 2s. 6d.
	{m =	2·5}	
1586	m =	3·0	Newfoundland, south coast :—Wreck island to Cinq Cerf bay, including Connoire, Muddy Hole, and Couteau bays, 2s.
2516	d =	3·6	North America, east coast :—Gulf of St. Lawrence and the river to Quebec, 2s. 6d.
1621	m =	0·19	North America, east coast :—Entrance to the river St. Lawrence, 2s. 6d.
2034	m =	0·24	North America, east coast : Northumberland strait, 3s.
1003	m =	1·0	Africa, east coast :—River Pungue, 1s.
705	m =	0·7	Madagascar, north-west coast :—Pasindava bay to Merintsa island, 2s. 6d.
317	m =	2·9	Madagascar, north-west coast :—Andranoambi bay. Ampamonti and Ampasindava bays, 2s.
1054	m =	2·9	Madagascar, north coast :—Port Liverpool, 1s. 6d.
1761	m =	0·24	China, east coast :—Ockseu islands to Tung Yung, including the north part of Formosa from Nan-sa-sha river to Ke-lung harbour, 2s. 6d.
316	m =	3·1	Gulf of Tartary :—Castries bay, 1s. 6d.
2923	m =	0·5	Australia, east coast :—Hope islands to Turtle group, with the adjacent Barrier reefs, 3s.
2922	m =	0·5	Australia, east coast :—Turtle group to Claremont point, 3s.
29	m =	3·6	South Pacific Ocean :—Rapa (Oparo) island, 1s.
2275	.. ..	.. ..	Onega gulf :—New plan, Onega road and entrance to river Onega.

No.		
87	.. .. .	Cape Finisterre to cape St. Vincent:—New plan, Peninsula of Periche.
198	.. .. .	Policastro to cape Sta. Maria di Leuca:—Plan added, Port Sta. Venere.
1394	.. .. .	Malay peninsula, east coast:—Plan added, Entrance to Rumpin river.
2376	.. .. .	Harbours in Formosa island:—New plan, Tamsui harbour.

(J. D. Potter, Agent.)

CHARTS CANCELLED.

No.		Cancelled by	No.
1626	Blyth	New plan, Blyth	1626
1661	Port Moudros and Port Kondia ..	{ New plan, Port Moudros (Porto San Antonio) and Kondia ..	1661
1671	Port Sigrì	New plan, Port Sigrì	1671
846	Limasol	{ New plans, Limasol, Larnaka ..	846
848	Larnaka		
2516	Gulf of St. Lawrence and the river to Quebec	{ New chart, gulf of St. Lawrence and the river to Quebec	2516
2034	Northumberland strait, eastern part	{ New chart, Northumberland strait ..	2034
1747	Northumberland strait, western part		
648	Plan of river Pungue on this chart	{ New plan, river Pungue	1003
1761	Port Matheson to Ragged Point ..	{ New chart, Ockseu Islands to Tung Yung	1761
2405	Plan of Castries Bay on this chart	New plan, Castries Bay	316
29	Ahurei bay	New plan, Rapa (Oparo) island ..	29

CHARTS THAT HAVE RECEIVED IMPORTANT CORRECTIONS.

No. 2219. England, south coast:—Needles channel, with Christchurch bay. 1411. Wales, west coast:—New Quay to Holyhead. 122. North Sea:—Mouths of the Maas. 160. Italy, west coast:—Civita Vecchia to Policastro. 1551. Bay of Fundy:—St. John harbour. 2075. West Indies:—Great Bahama bank, sheet 3. 2820. Gulf of Mexico:—Pensacola bay entrance. 2689. North America, west coast:—Haro and Rosario straits. 1922. North America, west coast:—Fraser river and Burrard inlet. 648. Africa, east coast:—Delagoa bay to river Zambesi. 1003. Africa, east coast:—River Pungue. 1235. Persian gulf:—Mouth of the Euphrates. 40. India, west coast:—Karachi harbour. 1047. Australia, north-west coast:—Cape Ford to Buccaneer archipelago. 938. New Guinea:—East cape to cape Nelson. 939. New Guinea:—Cape Nelson to Hercules bay. 2421. South Pacific ocean:—Tonga or Friendly islands.

(J. D. Potter, Agent.)

Portuguese Charts.—Reconhecimento hydrographico da Foz do Pungue e do Buzio com parte do curso d'este Rio, Provincia de Moçambique, 1891. — Plano hydrographico de Landana ao Massabi. Provincia de Angola. 1891. — Carta da Ilha Brava (Cabo Verde). 1891. Comissão de Cartographia, Lisboa. (*Dulau.*)

United States Charts.—No. 1263, Monocacy Anchorage. Crichton Group, Pañon Do, Korea. Price 1s. 1d. No. 1268, Asuncion and San Roque Bays, West Coast of Lower California. Price 2s. 1d. No. 1274, Chabrol Harbour (Ualan

Island), Caroline Islands. Price 2s. 1d. Pilot Chart of the North Atlantic Ocean, July, 1891. With a supplement showing the drift of the Bottle Papers in the North Atlantic. Published at the Hydrographic Office, Navy Department, Washington, D.C. Richardson Clover, Lieut.-Comdr. U.S.N., Hydrographer.

ATLASES.

Stieler's Hand-Atlas.—Neue Lieferungs-Ausgabe von ——. 95 Karten in Kupferdruck und Handkolorit, herausgegeben von Prof. Dr. Herm. Berghaus, Carl Vogel und Herm. Habenicht. Erscheint in 32 Lieferungen (jede mit 3 Karten, die letzte mit 2 Karten und Titel). Zweiunddreissigste (32) Lieferung (Schluss). Inhalt: Nr. 50, Balkan-Halbinsel, Übersicht in 1:3,700,000, von C. Vogel. Nr. 65, Afrika, Übersicht in 1:25,000,000, von H. Habenicht. Titelblatt in Kupferstich, von H. Berghaus. Inhaltsverzeichnis. Gotha, Justus Perthes, 1891. Price 1s. 6d. each part. (*Dulau.*)

The present issue contains maps of the Balkan Peninsula, a general map of Africa, on which the political boundaries are correctly laid down, with an inset of East Africa on an enlarged scale, the title-page, and a table of contents. With the issue of this part the present edition of this excellent atlas is complete as regards the maps; the index is yet to follow. The atlas contains ninety-five principal maps, and numerous insets. The care that has been exhibited in the compilation of the maps, and the beautiful manner in which they are executed reflects the greatest credit on all concerned in their production.

Universal Atlas.—The —, complete in 28 parts, including Index. London: Published by Cassell & Co., Limited, for the Atlas Publishing Company, Limited. Part 5. Price 1s. each part.

Sheet 9 contains a map on Mercator's projection, to illustrate the religions of the world, with three insets showing the distribution of Europeans, Chinese, and Negroes. On sheet 10 two maps are given, on one of which the annual isotherms and winds of the world are shown, and the other is a map of the religions of Europe. A map of South America occupies sheets 99 and 100, with insets, on an enlarged scale, of Rio Janeiro, Espirito Santo, and a part of Minas Geraes; South-east Brazil and Uruguay and Chili from the southern end of the island of Chiloe to Blanca Encalada in the north. The maps are all nicely drawn, and the colouring is well chosen.

PHOTOGRAPHS.

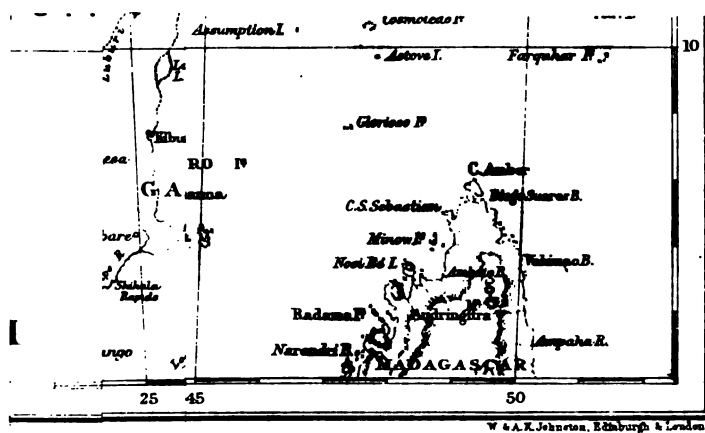
Black Mountain, &c.—N.W. Indian Frontier.—Four Photographs (panoramas) of the Miranzai (Samana) country and the Black Mountain, taken by Colonel A. Le Messurier, R.E., in March and April 1891, and presented by him to the Royal Geographical Society.

These four panoramas form an acceptable addition to the Society's collection. They are all good specimens of photography, and the donor has enhanced their value by giving the names of mountains, their elevations, and the positions from which the views were taken.

Iceland.—Nine Photographs of scenery in —, taken by F. W. W. Howell, Esq., in 1890, and presented by him to the Royal Geographical Society.

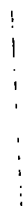
These photographs are quarter-plate size; they are clearly taken, and serve very well to illustrate the characteristic features of the part of Iceland visited by the donor.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.



W & A K Johnston, Edinburgh & London

Society 1891



PROCEEDINGS
OF THE
ROYAL GEOGRAPHICAL SOCIETY
AND MONTHLY RECORD OF GEOGRAPHY.

The Yoruba Country, West Africa.

By ALVAN MILLSON, M.A.

(Read at the Evening Meeting, June 29th, 1891.)

Map, p. 644.

BETWEEN the great bend of the river Niger and the surf-bound coast of the Gulf of Guinea lie more than 600,000 square miles of well-peopled and fairly fertile land. Not the least remarkable feature in our dealings with this portion of West Africa is the fact that its tribes, although they maintain a standard of comfort far superior to that of the Fellah of Egypt, or the Indian peasant, are dependent to a remarkably small extent upon Europe for their wants and luxuries. Until comparatively recent years indeed, although European commerce with the coast-line of the Gulf of Guinea dates from the 15th century, their tendency has been to produce their own necessities of life, and to fetch their supplies of foreign articles from the north and east, on the ships of the desert, rather than from the nearer ports of the ship-frequented southern coast. The opening-up of the Niger to traffic during the past half century, has doubtless done much to remedy this evil; but had no such ready means of water carriage to the interior existed, the ports of the Western Soudan and of the nations to the south of the Niger would have continued to be those of the Mediterranean shores, and such traffic in European goods as existed would have continued to follow the slave routes and to enrich the fanatical Mahommedan conquerors, whose trade enterprise leads inevitably to war and slave raids. For when Rohlf's passed through Ilorin in 1867, the "torboushes" of Vienna, transported for no less than 2000 miles across the Sahara, had a regular sale in the markets of that city at a distance from the Bight of Benin of less than 150 miles.

Climate alone and the African's code of ethics "so to deal with others as thou wouldst thyself hope to avoid being dealt by," would not have sufficed to prevent the entrance of European commerce from the Atlantic coast. Still more powerful reasons are needed to account for

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the absolute isolation of the interior; and the more one examines the possible causes of so strange a state of affairs, the more one is forced to trace its origin to slave raids. Dahomey annually marches out to desolate the lands of some weaker tribe, or to ravage the outlying towns of Yoruba; the Ibadan Yorubas still strike terror into the less powerful peoples that surround them; while on the north the Mahomedan tribes carry on a ceaseless "jihad" in the hopes of eventually enslaving the inhabitants of the populous cities and farms of the coast tribes, and foster by their intrigues the slave wars of the unbelievers in order to maintain by purchase or desertion a sufficient supply of slaves. The horses of the Soudan are the chief medium of exchange, and when I mention that a 15-hand horse cannot be purchased in Yoruba for less than seven slaves (= 70*l.*), and that it is the pride of each chief to own several such horses in preference to the lowland ponies, it will readily be understood how large and remunerative a traffic is carried on by the Mahomedan horse dealers.

In addition to commercial causes there are, moreover, in the eyes of the natives, good and sufficient reasons why these slave raids should not cease.

The Yorubas, for instance, are a race of farmers in a fully cultivated country, where game is scarce, and meat and milk are comparative luxuries. As a natural result, the children, who cannot in their early years be successfully reared upon the produce of their father's farm, are nourished by their mothers for three or more years. During this period the mother retires to her parents' home, occupies once more the room in which she dwelt as a maiden, devotes herself entirely to her child, and ceases to belong to, or, in many cases, to be maintained by her husband. The father, fully occupied in the labour of his farm, is forced to obtain by theft or purchase a second, and in due course a third wife to help him in his household. A mother who fails to comply with this custom loses her position as a respectable woman and becomes an outcast. The result of this otherwise not unreasonable practice is a constant demand for more women than the tribe can supply, and its natural outcome is to be seen in a succession of intertribal raids, undertaken with the connivance of the authorities, who share the spoils and organise the expeditions.

The isolation of the interior produced by the slave trade has doubtless been perpetuated by the fact that the trade which supplanted it is chiefly in the produce of the oil-palm (*Elaeis guineensis*) a tree which does not flourish above a certain distance from the coast, varying from 100 to 150 miles.

The present position of affairs may be stated to be somewhat as follows. The sloping terraces and rocky ranges which buttress up the great plateau of Central Africa for some 80 or 100 miles inland from the Guinea coast are inhabited in the main by fetish-worshipping negroes, who are enabled, by European weapons and the rugged nature of their frontiers, to keep in check the inroads of the Mahomedan cavalry of

the Soudan. They are, however, slowly yielding to the pressure from the north, and to the insidious efforts of the followers of the Senoussia, who have settled in their midst in the guise of peaceful merchants or travelling charm-sellers.

Greed for gain and the profits of their trade with the coast has given rise to a complete and exclusive middleman system, which prevents the entrance of European merchants into the interior and seriously curtails the development of commerce.

The coast tribes, and by this I mean those who are settled in the broken country within 100 miles of the shores of the Gulf of Guinea, from the Scarries river to the mouth of the Niger, may be estimated at not less than twelve millions in number, spread more or less thickly over an area of about 100,000 square miles. They are divided by racial and intertribal slave wars into almost innumerable subdivisions; those at a certain distance from the ports are kept from trading to the sea by their brethren who have the advantage of position, and they are at the same time subjected to a steady pressure of conquest from the north. The fertility of their land, and their rapidity of increase, alone save them from destruction.

The ancient kingdom of Yoruba may be taken as one of the most interesting of these great tribal divisions, both as regards its geographical situation and national character. Of the conditions of life in this tribe, and of the commercial advantages to be derived from closer intercourse, I had an opportunity of forming an opinion in the course of a political mission upon which I was employed during the past year.

Landing at Lagos, the only natural harbour on a thousand miles of coast, a narrow entrance with a fifteen feet bar leads into the intricate chain of waterways, which extends, with few and slight interruptions, for 500 miles from the Volta river to the Benin branch of the Niger Delta. From the east and west, from the Benin river and the waters of the Dahomian frontier, the coast of the gulf is backed by intersecting channels of fresh water flowing steadily from either hand towards the Lagos outlet. In many places these narrow and brimming channels are separated from the onslaught of the Atlantic rollers by no more than five or six score level yards of shifting sand; the spray from the ocean drifts over them, and the roar of the surf is heard by the native as he glides over their calm surface in his fragile canoe. These so-called "lagoons of the Bight of Benin" form but a small portion of the littoral river systems of West Africa; for from Cape Palmas to Cape Three Points the long Kroo coast is lined by inland waters for the greater part of 300 miles, and beyond the rocky spurs of the beautiful Gold Coast the Dahomian shores have the same remarkable formation. At right angles to this network of channels numerous rivers flow down from the uplands of the interior, carrying in their rapid streams vast quantities of sand and mud with which they busily build out the land. At first sight it seems strange that so many and such powerful streams, flowing strongly

from the uplands towards the sea, should suddenly be turned aside from their courses by so narrow and fragile a barrier of shifting sand. To the influence of the sheltering headlands which jut out towards the south; to the rapid Guinea current which tears away the face of their rocky shores and hurries towards the east a ceaseless stream of sand; to the almost tideless ocean, and the absence of high winds, for the strength and duration of a West African tornado are but slight as compared with the hurricanes of the West Indies or the gales of our stormy coasts; and above all to the enormous growths of floating papyrus and water-grass which line the inner banks of the lagoons and prevent the swollen waters from breaking through into the ocean, are due the formation and continual development of this strange delta system. For these rivers are in most instances choked for many miles by a floating papyrus-sod, bound together by wild water-figs and palm-wine palms (*Raphia vinifera*), and when the floods come down from the interior great masses of this floating vegetation are torn away and carried down to the lagoons and onwards towards the sea. Hundreds of acres of these grass islets are annually carried down from each of these rivers, and are driven against the banks of the littoral lagoons where they lodge and grow, and eventually become anchored in their places by more permanent vegetation. In this manner the lagoon sides are padded for hundreds of yards, and even, in some instances, for two or three miles in depth on either hand, and their banks are protected from the wash of the current and the weight of the accumulated waters. By this means the frail barrier of sea-sand is strengthened, and the inland waters, although they frequently rise to a height of five to six feet above the sea-level, are effectually prevented from bursting through their banks. Not only are these growths a permanent protection to the land, but by their very nature, floating as they do on the surface of the water, they rise and fall with the floods, and are always ready with their assistance at the right time and place.

Were all the rivers which feed the lagoons freed from their natural obstructions, as is the case with the Ogun river near Lagos, the interior, to a distance of from 30 to 70 geographical miles, would be thrown open to commerce, and the wonderful system of inland navigation which fosters the coast traffic would be still further developed.

The Oshun river, for instance, which carries, even in the dry season, more water than the Thames at Kingston, would enable launches and lighters to penetrate to the Ibadan farms in the heart of the most populous and promising commercial tribe in West Africa. The Oni, in a similar manner, would open up more than 50 miles of Eastern Yoruba, whose rich mountains and valleys will some day be a source of great agricultural wealth, while the Addo, the Opara and the Eso (Is-au) rivers would serve to tap the commerce of Western Yoruba and Eastern Dahomey.

Within the gap through which the accumulated waters of these

rivers pour out into the sea, stands the city of Lagos, whose population cannot be less than 60,000, and through whose port about a million and a quarter in value of produce and goods pass to and from Europe every year. To the unfortunate intertribal jealousies of which I have already spoken is due the fact that the roads and rivers which lead to the interior are in most cases closed to commerce, and to the Mahomedan pressure on the northern frontier of Yoruba is to be credited the patience of that powerful nation in permitting a weaker tribe of their own family to block so completely all intercourse with the coast. To both are due the difficulty of maintaining and developing a trade of a million a year in a port which should be able to boast of at least three times as much.

From Lagos, four hours steaming along the the eastern inland waters brings one in a launch or stern-wheeler to the landing place of Ito Ike, in the estuary of the Omi river, some four miles from its junction with the lagoon. From this place, or from Ode Ketu, a few miles further to the east, it is usual to start for the interior. Both these landing places are markets in the territory of the Ijebus, a weak branch of the Yoruba family, whose geographical situation has hitherto enabled them to hold the interior commerce entirely in their own hands, and to prevent the spread of European enterprise and civilisation.

From Ito Ike or Ode Ketu, about 16 miles walk brings one to Ijebu Ode, the capital of the tribe, a town situated about ten miles, as the crow flies, from the lagoon side. The size and importance of this place have in the past been very much exaggerated, owing to the cunning practice of leading visitors by devious roads when taking them to see the king. Previous estimates have given the population at not less than 40,000, but from somewhat careful calculation I am inclined to say 13,000 is much nearer the truth, and of these most of the able-bodied men are scattered on trading expeditions throughout the interior. For the Ijebus have carried the "hinterland" doctrine to its logical conclusion, and not only proclaim the interior to be under their influence but forbid any trader to pass in any direction through their country, thus retaining the entire trade of central Yoruba in their own hands.

At Ode Ketu landing-place the road suddenly ascends from the made lands of the lagoons about 100 feet to the gentle slopes of the first terrace of the interior. The traces of this ancient sea beach can be followed for miles on either hand, and as one looks down in the early morning on the mists of the lower lands one can picture to oneself the days when the Atlantic rolled in upon the rocks and drove its surf up the slopes of the steep ascent.

Hardly broken by the scattered farms of Ijebus, a thick forest covers the whole country from the edge of the lagoon to the southern confines of central Yoruba, some 62 miles by road from Ode Ketu. When I say a "thick forest," I do not for a moment compare it with the dense vegetation of Brazil or Central America, nor is the usual description "the impenetrable forest of West Africa" at all applicable.

Fifteen miles to the north of Ijebu Ode by a devious trail lies, or rather lay, for it has since been destroyed by civil war, the toll town of Oru, a place of some 4000 or 5000 inhabitants, established for the purpose of preventing the Yorubas from passing to the coast. Here one finds the African toll-gatherer in all his insolent glory, robbing, oppressing and insulting travellers to his heart's content.

While passing through the toll-gate, one of the fowls that I had provided for my food on the journey began to crow lustily, whereupon, although he knew that I was the guest of the King, or Awujale, as he is called, the toll-gatherer rushed out and seized the man who was carrying the irrepressible bantam, and insolently informed me that he had forfeited his liberty by allowing the bird to crow. At this we all laughed mightily and passed on without rejoinder. There was no doubt, however, in my mind that had we been a less powerful party the results would have been more serious. I mention this, as an instance of the trivial pretexts of which these Ijebu toll-gatherers avail themselves to support their insults and exactions.

From Oru to the northward, thirty-one miles of "No Man's Land," rich in soil and covered with forest, separates the Ijebu from the Ibadan Yorubas, a large deserted war camp at Olowa alone serving to remind one of the powerful nation which lies so near at hand. At the stream and village of Odo Ona Kekere the dim forest suddenly gives place to open cultivated land, busy figures are seen on all sides in the farms, carriers and labourers travelling rapidly along the broad and well-cleaned roads, mark one's approach to a city, and fully clad men and women replace the half naked and not over clean Ijebus. Civil salutations greet one on all hands instead of the insolent and vacant stare to which one has been accustomed, water is stored in large jars near every hut or roadside shed, and may be had for the asking or taken freely by the passing traveller, while cooked food and other necessities can be purchased *en route* at exceedingly low prices. There is indeed a custom among the Yorubas of the interior that the passing traveller may stop at any farm or field and cook sufficient food from the standing crops for one meal, but it is considered a very heinous offence for him to carry any away with him. I have often seen on a mat by the roadside portions of agidi (maize-flour starch) or bean bread, or cooked yams, or akara (a savoury ball of beans and pepper fried in palm-oil) carefully arranged for sale, while near at hand a broken calabash was placed for the receipt of cowries (the currency of the country). In passing by, my men would choose what they wanted, and would put a number of cowries into the calabash, after consulting among themselves as to the exact price which they had paid at the last town or market-shed. For 40 cowries (less than a halfpenny) a man could fully satisfy his hunger—and the hunger of an African labouring under a heavy load from 15 to 20 miles a day is not to be easily appeased. Though I had among my carriers men who were probably not unacquainted with leisured retirement within the

walls of Lagos gaol, it never occurred to them to underpay or to take that of which they did not know the price. The owner of the articles would probably be a mile or two away, working placidly at home while her mats did business for her at the roadside. Even an automatic postage stamp machine company would have no difficulty in realising a dividend in such a community. It is at the same time to be remembered that dishonesty in other forms is as prevalent in Yoruba as elsewhere.

Some three miles to the north of Odo Ona Kekere, from the crest of a rising in the undulating land, the great city of Ibadan—the London of Negroland—comes full in view, extending for over six miles from east to west, and for more than three from north to south. Surrounded by its farming villages, 163 in number, Ibadan counts over 200,000 souls, while within the walls of the city itself at least 120,000 people are gathered. Its sea of brown roofs covers an area of nearly 16 square miles, and the ditches and walls of hardened clay, which surround it, are more than 18 miles in circumference. Its houses are built round court yards with a single entrance, and form in themselves no mean defence against native inroads. Their walls of thick “adobe” are blank on the outer face, and the thatched roofs are made of a light covering of palm leaves and grass, in order to avoid the danger of extensive conflagrations, which might arise were the thatch more thickly packed. In the winding rocky streets which intersect these large compounds in every direction, are countless market booths and occasional market places where the inhabitants can purchase native produce, food, and European luxuries. In the same way, by the sides of the country roads are built, at irregular intervals varying from one to six miles, long low sheds close by some well or running water, where the farm women sit and “make their market,” unless, indeed, they prefer to leave their commercial interests to the care of their patent automatic retailing machine. In the farms which extend throughout the country from horizon to horizon as one journeys through it, save where the land is too poor, or the fear of war has desolated the neighbourhood, can be heard the crowing of cocks, the barking of dogs, the shrill laughter of children, and the vociferous clamour of native homestead gossip. For among natives, as among seafaring folk at home, a hundred yards or so is no impediment to polite conversation. From this custom arises the disadvantage that the voices of the people being naturally pitched for distant communication cannot readily be restrained or focussed for nearer ranges of social intercourse. The consequent turmoil and shrill cries are apt at first to unsettle the nerves of an inexperienced traveller, but a few weeks’ residence in the country not only accustoms one to their manner of speech, but inures one’s system to the sudden shock of their sonorous voices.

Northward from Ibadan, which may be described as the centre of the chief military and commercial power in Yoruba, two days’ journey—about 40 miles—through many villages, and a landscape dotted far and near with oil-palms (*Elais guineensis*), along a road thronged with travellers,

brings one to the capital of central Yoruba, Oyo (Awyaw). On leaving Ibadan I passed in the course of our morning's march over 4700 men, women, and children, hurrying into the great city from the farm villages, with loads of maize, beans, yams, yam flour, sweet potatoes, fowls, pigs, ducks; or driving cattle, sheep and goats; or mounted on small native horses which amble quickly along under the combined influence of an Arab ring-bit and an armed spur which leaves its traces in deep scores along the flanks of the poor animals.

Far and wide the land has, for generations, and indeed for centuries, been cultivated by these industrious natives. The hatchet, the fire, and the hoe have removed all traces of the original forest, save indeed where a dark trail of green across the landscape shows where the valley of some narrow watercourse or larger river is hidden among trees.

For two or three years at most the land is allowed to lie fallow, while for three or four years double or treble crops are raised with no further cultivation than an occasional scrape with a hoe, and during its fallow time no further care is taken of it than to let a rank growth of reedy grass spring up some six or eight feet in height. Among this grass can be seen the seedlings and young plants of a new forest which would rapidly take possession were the land to be permanently deserted.

In spite of this careless and exhausting method of cultivation the crops maintain an excellent average, and the same plot of ground serves for generations to support its owners.

The following extracts from notes taken at the time will serve to explain the apparently inexhaustible fertility of a soil which does not at first sight show any signs of unusual richness.

"Were one to visit Yoruba during the early part of the rainy season only, it would appear impossible to account for these facts . . . while under our feet unnoticed was going on the careless labour of the real fertilizers of the land."

"In the dry season the mystery is at once solved, and in the simplest and most unexpected manner. The whole surface of the ground among the grass is seen to be covered by serried ranks of cylindrical worm casts. These worms casts vary in height from a quarter of an inch to three inches, and exist in astonishing numbers. It is in many places impossible to press your finger upon the ground without touching one. For scores of square miles they crowd the land, closely packed, upright, and burnt by the sun into rigid rolls of hardened clay. There they stand until the rains break them down into a fine powder, rich in plant food, and lending itself easily to the hoe of the farmer. Having carefully removed the worm casts of one season from two separate square feet of land at a considerable distance from one another, and chosen at random, I find the result to weigh not less than 10½ lbs. in a thoroughly dry state. This gives a mean of over five lbs. per square foot. Accepting this as the amount of earth brought to the surface every year by these worms, we get somewhat startling results. I may say, speaking from

the result of numerous experiments, that five lbs. is a very moderate yearly estimate of the work done by these busy labourers on each square foot of soil. Even at this moderate estimate, however, of the annual result of their work, we have a total of not less than 62,233 tons of subsoil brought to the surface on each square mile of cultivable land in the Yoruba country every year. This work goes on unceasingly; year after year, and to the untiring labours of its earthworms this part of West Africa owes the livelihood of its people. Where the worms do not work, the Yoruba knows that it is useless to make his farm."

"Estimating one square yard of dry earth by two feet deep as weighing half a ton, we have an annual movement of earth per square yard to the depth of two feet, amounting to not less than 45 lbs. From this it appears that every particle of earth in each ton of soil to the depth of two feet is brought to the surface once in 27 years."

The earthworm which produces such surprising results has been identified as a new species of *Siphonogaster*, a genus hitherto known only in the Nile valley.

Favoured by a rapidly reproductive soil, and inured as he is from his infancy to habits of labour, the Yoruba is able to sell in his own markets at a wonderfully cheap rate. Maize in the grain at 6*d.* a hundred-weight, large yams at 3*d.* a dozen, sweet potatoes at 1½*d.* and shelled beans at 1*s.* 6*d.* a hundredweight, eggs at from ¾*d.* to 2*d.* a dozen, are examples of the prices ruling in the country; while the more expensive luxuries of beef and mutton are sold for less than 1*d.* a pound, goats for 2*s.* 6*d.* each, sheep for from 7*s.* to 8*s.*, fowls for 3*s.* a score, and the small cattle of the country for from 30*s.* to 2*l.* 10*s.* a piece. Cowries are the usual medium of exchange for small sales, and slaves represent the larger currency, varying in value from 4*l.* to 10*l.* The advantage of the slave currency is that it combines the interchangeability of a bank-note with the carrying power of a pack-horse.

When it is considered that at distances of one day's march from one another are to be found cities of from 20,000 to 60,000 inhabitants, such as Oyo (40,000-60,000), Iseyin (40,000-60,000), Ogbomoshow (60,000), Ejibo (22,000), Ede (30,000-40,000), Oshogbo (35,000-40,000), Iwo (60,000); and Ishaga (70,000); besides the still larger city of Ibadan, and the innumerable farm villages which are scattered over the central portion of Yoruba, making a population which has been variously estimated by different travellers at from two to three millions, it is easy to imagine how great must be the agricultural activity of the people, and how vast the proportionate area of land under cultivation.

The portion of the country lying between Ibadan and Oyo (Awyaw) which I have already described, may be taken as a fair specimen of the whole.

Of the future commercial development of so rich a country much is to be expected. During my visit to Ibadan and Ikirun, palm-oil was selling at the rate of 3*l.* 15*s.* a ton, and palm kernels at 3*l.* a ton, the

prices in Lagos of these staple articles of West African commerce varying between 17*l.* 10*s.* and 23*l.* a ton for oil, and 9*l.* and 10*l.* a ton for kernels. Small tusks of ivory were selling at Ikirun for 6*d.* a pound, and large ivory could have been bought at very low rates had I been able to transport it in my baggage. The gravel ridges, which alternate with the richer lands, were covered with shea-butter trees which yield a valuable vegetable oil, the water-courses were shaded by gum-bearing acacias, ogea-gum trees and camwood trees, while the forest lands of Ijebu and Ijesha contain numerous valuable timber trees. In addition to the above products of the country there are many minor articles of commerce, such as benniseed, ground nuts, and dyes, while the most important consideration of all, in my opinion, is the future development of good qualities of cotton, coffee, cacao, and other valuable plants, which are rapidly being introduced among the natives. When I state that over 80,000 young plants of cocoa, coffee, kola, coco-nut, and other economic trees have been distributed since its foundation in the month of May 1888, by the Botanic Centre of the colony of Lagos, and that over 60,000 of these were eagerly purchased by the natives, it will readily be understood that one is not in error in counting upon their keen interest in agriculture as a means of profit as well as of actual maintenance. With regard to the present quality of the cotton which is grown in such vast quantities in Yoruba, and can be shipped for about 3*d.* a pound, it is declared by those who are most capable of judging, that, although the supply is intermittent and the sample not over clean, it is very well thought of in the Liverpool market, and commands a paying price, equal to that of Louisiana and superior to that of India. A considerable supply of Egyptian and American cotton-seed has been introduced into the interior by the government of Lagos, and it is hoped that a marked improvement in quality will be the result.

It must not be forgotten that the Yoruba is by custom a fully clothed mortal. It is considered in the highest degree unfashionable to appear in the public streets without a complete covering of two or three ample and well-dyed cloths, draped round the body in not ungraceful folds. From careful calculations it appears that the Yorubas consume not less than 31,000,000 yards of cotton, silk, grass and mixture cloths, or about 30 yards for each male adult, not less than 45 yards for each female adult, and over six yards for each child. Of this very large consumption of cloth, over 95 per cent. is of home manufacture, made of home-grown cotton, dyed with native dyes, of which the African indigo (*Lonchocarpus cyanescens*) is the chief, and woven of yarn spun by hand in a most primitive manner. I have estimated that nearly 25 per cent. of the total population is engaged during the greater portion of its hours of labour in preparing cloth or dyes for the native market. The richer cloths alone, such as silks, velvets, velveteens, sateens, and damasks are purchased from Lagos through the Ijebu middlemen by the wealthier slave owners and chiefs of the interior at most exorbitant rates, repre-

senting in many instances nearly 200 per cent. of profit. These goods are mainly paid for in food stuffs, palm-oil, and slaves, and the trade as at present existing has no pretence to being healthy or carried on with an even hand. Supplies of powder, salt, and other necessities are arbitrarily stopped by the middlemen until exorbitant prices are agreed to, and the traders demand large presents and make unreasonable claims before parting with their goods.

Accepting the annual consumption of native cloth in Yorubaland at 30,000,000 yards, and reckoning the price at not more than 3*d.* a yard, we have the somewhat startling figures of 375,000*l.* as the value of the yearly output of the native looms, the average wages of the weavers amounting to less than 2*d.* a day, while those of the cultivators, cleaners, and spinners are much lower than even this not excessive rate of earnings. By carrying produce to the coast markets I have estimated that the native would earn not less than 7*d.* a day, were the roads thrown open to traffic. It is, therefore, unreasonable to suppose that the eager Yoruba would resist the temptations of so golden a dream, and would refrain from placing on the European market his palm-oil, palm kernels, cotton, and other valuable produce. Assuming that in return he laid out only half his earnings upon cotton goods, or, to be still more moderate, that the European merchants would not be able to supplant more than half the native looms, we would have an immediate increase in our imports of cottons into Lagos, amounting to 187,000*l.* To this would have to be added an equal or greater consumption of tobacco, spirits, gums, powder, cutlery, &c., which should, according to the relative proportion of such imports in the past, increase the total addition to the imports of the colony by over 400,000*l.* a year. This would of course represent an equal or greater export of produce which has at present absolutely no market, and the result would be an immediate increase of between 800,000*l.* and 1,000,000*l.* to the trade of Lagos.

Were more unrestricted traffic possible with the coast, there is every reason to believe that the slave wars of the interior would, so far as Yoruba is concerned, be neglected for the more profitable occupation of trade, and that the young men, whose love of adventure is now fostered by war, would turn their energies to good account in indulging the most deeply rooted passion of the African heart, the love for trade, and by African trade is meant the adventurous spirit of travel, the keen delights of bargaining, and the innumerable opportunities of sharp practice. There is nothing more wished for at the present moment by the Yorubas than the power to exchange their present system of raids and jealousies into commercial competition, and by availing themselves of open markets to arm themselves more strongly against the Mahomedan conquerors who are pushing them slowly towards the sea.*

* For discussion see p. 591.

A Journey through Gazaland.

By DENIS DOYLE.

(Read at the Evening Meeting, June 29th, 1891.)

Map, p. 644.

I HAVE been asked to give a short account of my journey in January last from Manica to the mouth of the Limpopo.

The actual distance travelled was between 700 and 800 miles, which was traversed in 46 days. Our party consisted of three white men—Dr. Jameson, Mr. D. G. B. Moodie, and myself, and twenty-seven native carriers.

Although the season of the year at which we undertook this journey was known to be the most unhealthy and difficult for getting through the country, it was decided, much against the advice of the old hands, to attempt it. Leaving the head of the Umtali valley on March 16th, on the high plateau close to the kraal of Umtassa, we travelled in a southerly direction. We soon found that we would have to take a course somewhat to the west of a straight line, to prevent our being stopped by the rivers, which were then swollen and almost impassable. By this course we crossed nearly all the head waters of the rivers, and, with the exception of the Sabi, had no rivers to swim or ford that were in any way dangerous.

Our first day's journey brought us to Umzimonya's kraal, having travelled through a beautiful fertile country, and grass-clad hills. We camped for the night on a high flat rock, surrounded by immense granite koppies, on the top of which, as is usual in that region, the kraal of the chief and his people was built.

From here, through a finely-wooded country, we continued for two days, accomplishing about 20 miles a day.

From the top of the hill in Umgwenas country could be seen the vast undulating wooded plains occupied by the remnant of Umtama's people, a chief whose ancestors exercised sway over the greater portion of what is now called Northern Gazaland. In some instances through this country the height above the sea level was 5000 feet. For the next two days our course continued through the same broken country, plentifully watered with running streams every few miles, and with granite koppies surrounding us. On our left in the distance could be seen Chinanimani Pass. From this point the country became less broken, and in parts very beautiful, high grass-clad mountains and delightful valleys extending as far as the eye could reach, fitted for either agricultural or pastoral pursuits; in all directions could be seen a country calculated to carry an enormous European population. No sign of habitation could be seen anywhere, the natives having built their

kraals in the most inaccessible places, which could be reached only by paths known to the native guides.

At this point we leave the granite formation and enter upon the slate, and the expert who accompanied us (Mr. Moodie) stated that this portion which we were now passing through (the head waters of the Lusiti) was gold bearing. For several days the same description of country was followed. Near the head waters of the Lusiti some old gold workings were found, of the same character as those found in Mashonaland and Manicaland.

Passing through the dense bush of Shekwanda's country we suddenly commenced to descend to a much lower level, until the site of Manhlagas (Gungunhana's old kraal) was reached on the fourteenth day. The beauty of this country is difficult to describe, and its eminent fitness for agriculture for hundreds of miles round this kraal could hardly be overestimated. It was at this kraal only that any one was found acknowledging Portuguese authority in the country. Dropping so suddenly from the high plateau, along which we had travelled for 14 days, between 4000 and 5000 feet high, into the low country of 860 feet above sea level, the heat was intense, and both man and horse felt it extremely.

Crossing the Umswili river on the evening of the day that we passed Gungunhana's old kraal, we camped for the night in a deserted kraal, of which there are hundreds in the neighbourhood still existing, and in perfect order, showing that it was occupied to a recent date. This, I might explain, was caused by the whole of Gungunhana's tribe travelling to the southward for the purpose of punishing Spelanyana, who had raised the flag of rebellion against him.

The next day was occupied in reaching Senumba's kraal, still travelling through undulating wooded country. On the left might be seen the high hills overlooking the Busi, and a corresponding range on the right. Much the same description of country was followed until reaching the Sabi, which is here a river of $1\frac{1}{2}$ mile from bank to bank, and at the time we crossed it there was half a mile of very strong running water. Across the Sabi the country altered in appearance, and here the presence of Gungunhana in the south became at once apparent, as the natives in this part of the country spoke with bated breath of "The King."

Shishongi's country was passed through without much difficulty, being practically level. After crossing the Sabi the country was a dead level, being in no place above 300 feet above the sea, covered with bush here and there, and with magnificent forests of timber. For 50 miles to the north of Gungunhana's, at this rainy season of the year, there is a series of swamps, so deep as to take the horses off their legs in many places.

After leaving Mazebe's country, very fine forests of timber are fre-

quently found, and the enormous crops grown by the natives in these parts testify to the richness of the soil, and although in many places through which we passed the crops were not ripe and not harvested, yet in no case did we find the natives complaining of the barrenness of the soil. In this district the richness of the crops might be attributed to the unusually large quantity of rain that had fallen during the season, as we were informed that the vast plains between the Sabi and Mazibe's are, during the most part of the year, impassable on account of the scarcity of water, and it was only through natives acquainted with the country that water was obtainable on the occasion of our passing.

Gungunhana occupies a kraal situated 300 feet above sea-level, on a fairly healthy site. His kraal is the usual type of Zulu kraal, huts grouped together with an inner enclosure in which the royal wives are kept. Gungunhana himself has always been most courteous to us, and I am informed his fighting force consists of 20,000 warriors of pure Zulu breed, 2000 of whom are armed with the Martini-Henri, and the remainder with the shield and short assegai.

The country from here to the Limpopo in no place rises above 300 feet above the sea; there are some fine forests of timber, patches of bush, and lovely fertile valleys.

On approaching the Limpopo river the country becomes more swampy, and at this season of the year the banks are only approached through travelling some miles of slush and mud.

Bananas, pine-apples, and other tropical fruits might be seen here growing in wild luxuriance, and it was evident, from the amount of grain being harvested when we passed through, that, at any rate for this season, hunger would not trouble the people of Gazaland.

I have little more to add, but to say that throughout the length and breadth of Africa there are few places so well fitted to carry a large European population as North Gazaland, the portion which has been brought within the sphere of British influence under the treaty lately concluded with Portugal.

After the reading of the two foregoing papers,

Sir RAWSON W. RAWSON said: I venture to rise to ask for information. I will ask Mr. MILLSON if he can tell me whether the interior of the Gold Coast, not so far distant from Yoruba, is of the same character as that which he has described to us this evening. I am particularly interested, and should be glad to learn whether the country there is of the same character.

Mr. MILLSON: I think, in answer to that, I can add a little further information which will explain my ignorance; there is no country where the difference between one part and another is more striking than Africa. I think you may say that when you can step across a river from a fully-clad nation such as the one I have described, to one on the other side which I have not described, the clothing of which cannot be described because it does not exist, it will be readily understood how I am incapable of pronouncing any opinion on the country of which, though so near the places I have been describing, I know nothing except from hearsay.

The PRESIDENT said: I think the fact that no one present is able to add to the information which has been given us, either by Mr. Millson or by Mr. Doyle, is in itself a proof that their papers have been valuable contributions to geography. We have all been carried into regions about which I think we may say that until to-day we knew nothing. That is always agreeable, and it is particularly agreeable that we should have been able to conclude our session by two such valuable contributions. We have here present two gentlemen of South-east African descent—whom we are very glad to welcome here—the envoys of King Gungunhana. I hope they will tell their King, when they return, that his name has been received here in a very friendly manner, and that we learn with pleasure that his force is as considerable as Mr. Denis Doyle describes it to be. Before sitting down I would ask one more question of Mr. Millson. We were very much interested to hear that the British tin-plate trade is to a large extent dependent on African palm oil. We should like to know how that happens to come about. I was very much gratified to hear the observations which Mr. Millson made about Kew. No one who has administered a British province at a distance from the centre of the empire can fail to have been struck with the enormous work, the really imperial work, being done by that establishment. I do not know that anything remains for me to do except to give your thanks to the two gentlemen who have read the papers, to remind you that there are a great many interesting objects to be seen in the next room, and invite you to go there. I trust that we may all meet again in November, and have an agreeable recess.

Mr. MILLSON: I do not know myself the exact application of palm oil to tin plates, beyond the fact that a certain quality of palm oil derives its chief value from the limpidity which enables it to be used for the rolling or pressing, and thereby, I believe, for the polishing of the tin plates which are made to contain our daily food when travelling.*

* Mr. Millson has since communicated the following information on this subject, obtained from 'The Scientific American' of July 4th, 1891:—The plates are rolled in the ordinary manner into black sheets, eight of these sheets being rolled at one time, and after being sheared to size are placed in the "black pickle" bath of sulphuric acid, where all oxidation is removed. They are placed in an annealing furnace for thirty-six hours, and are next passed through the cold rolls, receiving a smoothly polished surface, after which they are annealed again and put into the "white pickle," where they are thoroughly cleansed from any oxidation, and are ready for the tinning process. The mode of putting on the coating of tin is a very simple one, and is begun by submerging the plates in a bath of palm-oil until all the water disappears, the oil forming a flux for the tin, the first coat of which is received in the tin-pot, the plates next being dipped into the "wash-pot," and when taken out the tin is spread over the surfaces with a brush by hand. The final act in the tin coating process is in passing the plates through rolls running in palm-oil, whereby the tin is evenly distributed, and a smooth surface is obtained. There are five of these rolls used, three running on top of two, and the plates make two passes through them, first being let down through the first and second of the upper set, and by a cradle arrangement are returned through the second and third. This completes the tinning operation proper, and the polish is obtained by rapid movements of the plates through bran and middlings, respectively, and then polishing with sheepskin. The result obtained at the Demmler works is a very excellent article of bright tin plate.

Notes on the present state of the Karun River, between Shushter and the Shat-el-Arab.

By HENRY BLOSSE LYNCH.

WHEN, in November 1888, it was officially announced that the Karun river had been opened to navigation as far as Ahwaz, the information concerning the nature and features of the whole Karun waterway was chiefly to be derived from Lieut. Selby's account of his ascent of it as far as Shushter in the steamer *Assyria* in the spring of 1842.* Fuller materials and new considerations are at the disposal of the navigator or writer at the present date. For over two years a regular fortnightly steam service has been established on the lower river, and for one year on the upper branches between Shushter and Ahwaz. The knowledge acquired during these periods I propose in this notice briefly to set forth. For a part of my information I am indebted to the careful reports which I have received from others; some of it rests on my own observation during the summer of 1889, when I visited Shushter twice.†

As far as Ahwaz, which is 117 miles by water from Mohammerah, the Karun is a broad river of considerable volume, and there is no obstacle to its navigation by a large river steamer, except during the very low season. Beyond the rapids of Ahwaz, which prevent continuous navigation, the same general features mark its course to the point of confluence of its two branches, the Shateit and Ab-i-Gargar, with the Dizful river at Bund-i-Kir, which is distant some 40 miles by water from Ahwaz, and about 25 by land. Without further preface I shall examine in sections the whole waterway between Mohammerah and Shushter.

1. Throughout its course between Ahwaz and the Shat-el-Arab the Karun is a broad and rapid river; its waters are charged with lime and are tinged with a whitish hue. The current varies from over five miles an hour in the high season and during rises, to under three miles in the low season. During the months of August, September, October, and November, there is least water, and between Ahwaz and the village of Kut Omeirah, a space of 20 miles, the navigation becomes difficult for a steamer drawing 3 feet 6 inches. At this period long banks of silt divide the broad stream into channels. It is, however, where the river spreads lakewise, just below the rapids at Ahwaz, that the shallows are most difficult to thread; the reach is obstructed by sandbanks which extend almost across it. Hitherto it has been often found necessary to discharge cargo and lighten the steamer until, the river rising, an

* See 'Journal of the R. G. S.,' vol. xiv. 1884.

† On the general subject of the Karun I would refer the reader to a paper by the Hon. G. Curzon, 'Proceedings R. G. S.,' September 1890. The most recent discussion of the origin of the Ab-i-Gargar and the great waterworks at Shushter will be found in an article by the same writer in the 'Fortnightly Review' of May 1890.

opportunity occurs to ship it away. It is probable that the channels will improve by the constant passage of steamers up them.

2. In the month of June 1890 the stern-wheel steamer *Shushan*, of 35 tons burthen, steamed safely through the rapids at Ahwaz, and was moored on the Shushter side. She has since maintained, under the Persian flag, a fortnightly service in conjunction with the steamers of the Euphrates Company on the lower river. The ancient city of Shushter, which has slept for centuries behind the Persian mountains, has thus been brought into regular steam communication with Europe and India. Besides the *Shushan*, a commodious steam launch has for some time been at the disposal of the Governor of Shushter; she is named the *Susa*, and it was in her that I descended the river to Ahwaz. She is under-engined, and I doubt whether she could stem the current in safety during the winter rises. From Ahwaz to Bund-i-Kir the navigation is easy, and although the stream is broad, the water is kept up by the rock ledges at Ahwaz. A large river steamer could ply on this stretch with ease. At several points, both above and below Weiss, some danger is caused by the remains of ancient masonry, piles of stone both above and below the surface of the water, which require to be removed or buoyed.

3. At Bund-i-Kir you have your choice of either of the two branches of the Karun, which, after their bifurcation at Shushter, embrace an extensive tract of potentially fertile country, and to this point converge and meet. Of these the best known is, perhaps, the Ab-i-Gargar, an artificial waterway. I descended it during the month of June in the steam launch *Susa*, and was very favourably impressed with it; the banks are high and the bed deep, but the narrowness of the channel, the shelving nature of the banks, and the abruptness of the bends render its navigation during the low season dangerous for a vessel of any size. Large stems of trees, too, have become imbedded in its marly bottom, whence they project above or just below the surface of the water. The *Shushan* navigated the Gargar for about two months (June and July), and was then taken to the other branch, the Shateit, on which she has continued to ply. Native cargo boats prefer the Ab-i-Gargar, and stop at a place called Shelalieh, some six miles by land below Shushter. Beyond this point the river can scarcely be termed navigable at present. I have followed it on horseback nearly the whole way from Shelalieh to the town during the low season in the month of August. I found that, besides several shallow places over which a steamer might possibly pass, there was one neck of silt and pebbles which would offer difficulty.

These obstacles are insignificant, and small steamers might readily be afforded access to the heart of Shushter, were it not for a long dam, an ancient work long since neglected, which runs across the dry river bed and leaves a narrow passage for the stream, which here makes an abrupt bend.

This partly natural and partly artificial barrier is situated some
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$2\frac{1}{2}$ miles by land from the town, and along a portion of the distance there is a fairly level road. The accompanying sketch is one I made of the river at this point. It illustrates several points to which I



2-1. From cliff to end of dam about 382 paces.

3-4. From end of dam to cliff about 153 paces.

may have on a future occasion to refer: at present, I would only call attention to the cliff-like banks which mark what was at one time the extent and volume of the Gargar. To make a navigable channel through this barrier some blasting of the massive rocks would be required. And if the Gargar is to be rendered suitable for larger

vessels it would be necessary to maintain a greater volume of water within it.

Now the level of this artificial waterway is far lower at its head in Shushter than that of the Karun proper, from which it diverges, and the water is admitted to it through subterraneous passages cut through the rock, whence it bursts in foaming cascades which are at once an ornament to the ancient city and a reproach to its present decrepitude. A larger supply of water might be introduced; nor would there be much difficulty in constructing a lock and weir at Bund-i-Kir, as has been suggested to me by Mr. A. B. Taylor, who has bestowed much attention to the subject. The distance between Ahwaz and Shelalieh is about 90 miles by river.

The advantage which the other branch, the Shateit, presents to the navigator consists in the greater breadth of the river; it is indeed the natural course of the Karun. On the other hand Shushter can only be approached at a distance of 18 miles by water and 11 by land. At a place called Chardinga steam navigation must for the present cease; beyond it long and irregular banks of silt and pebbles divide the stream into tortuous and narrow channels. It would be a work of some magnitude, I think, to bank the silt and concentrate these channels. Many will recollect similar works on the German rivers, as, for instance, in the reach of the Neckar above Heidelberg. The present terminus then on the Shateit is Chardinga, which is distant by river some 30 to 35 miles from Bund-i-Kir. There is, however, another disadvantage in the navigation of this branch, in addition to the distance of the terminus from the town; about a mile above its confluence with the Gargar and the Dizful river at Bund-i-Kir two natural ledges of submerged sandstone rock cross the stream at an interval of about 100 yards, and offer a serious impediment to a steamer during the low season. The channel is on the right bank, and the configuration of the reach is such that there is some danger of a vessel being thrown back on the first ledge while rounding the bend. At such a season there would not be more than three feet of water in the channel. It would of course be easy to blast the rock and deepen the passage, and if this were done a steamer of 300 tons could pass up the Shateit to Chardinga.

After its issue from the mountains in the vicinity of Shushter, the Karun traverses those vast and lonely tracts which stretch at the foot of Zagros, from Diarbekir to the Gulf. From the picturesque site of the aged and ruined city the eye follows the winding fork of the double river across a burning and deserted plain. Throughout its course to the Shat-el-Arab few villages line its banks; at long intervals the traveller passes a small settlement of mud huts. By day and by night the bleak landscape is hushed; and those who have travelled from the Tigris will miss the cheer of the Arab children as they race and leap over the gullies which break the river bank.

*African Boundaries, and the Application of Indian Systems of
Geographical Survey to Africa.**

By Lieut.-Colonel T. H. HOLDICH, R.E.

RECENTLY, during my service in India, several communications have been addressed to me asking for advice on the subject of commencing surveys in various parts of Africa. I have consequently assumed that there exists a serious intention of making a commencement in the detailed mapping of large tracts of country which have hitherto been but roughly reconnoitred. In these communications, however, I could trace no indication of the existence of any general scheme of survey (although such a scheme may exist), but only of scattered patchwork efforts here and there, which, being unconnected and carried out in a variety of methods and scales, would tend rather to the confusion than the advancement of exact geography in Africa. It is in the belief that, if indeed Africa can never be to us in all respects what India has been, there are so many points of marked analogy between the two countries which will render the adoption of Indian scientific methods peculiarly suitable, that I now venture to suggest the outline of a scheme, based on Indian experience, which may seem to tie up and piece together local surveys, and lead by the quickest road possible to a satisfactory and homogeneous map.

This outline may be roughly summarised as follows:—Firstly, the adoption of a rapid system of triangulation along the most important lines. Secondly, the extension of a graphic system of mapping from these lines by means chiefly of native labour.

Almost as a matter of necessity our attention will first have to be directed to our boundaries, for the first step towards consolidating our new dependencies must be to define the extent of them. Until quite lately, in spite of the expansion of the Indian possessions, and her colonial growth, England has been specially happy in rounding off her territories with great natural barriers of sea and mountain, which have kept her well removed from the dangers which beset powerfully-armed countries in close juxtaposition. Whether in Europe, Asia, Africa, America, Australia, or New Zealand, she has so far nothing to fear from any violent interest suddenly betrayed in her affairs which might be exhibited by nations with bigger armaments than her own, counting their guns by thousands and their soldiers by millions.

Even in India, that magnificent array of mountains set by the hand of nature across the northern limits of Hindustan, forms a boundary, unmatched in its impassability by any mountain system in the world, for at least four-fifths of India's landward frontier, leaving but a comparatively short line on the extreme north-west through the gates of

* Read at the Geographical Section, British Association, Cardiff, Aug. 1891.

which her teeming plains and cities can be reached. Thus even here we may congratulate ourselves on a remarkable position of natural security second only to that afforded by the high seas to the British Isles.

But events have travelled fast, and whereas some fifty years ago we were a happy people, counting up our possessions in a series of neat ring fences so constructed by nature that our modest assurance of being mistress of the seas was sufficient to warm us up to a generous feeling of contentment and security, we have now discovered that one short but weak corner of a fence may be a heritage of political vexation for years to come, whilst at the same time we have assumed the responsibility of maintaining no less than 9000 miles of new land frontier in Africa, to say nothing of a Burma-Chinese boundary which is as yet an unknown quantity. This need be no source of weakness to us. On the contrary, these boundaries should inclose immense sources of national wealth and strength. There need be no more weak links; all the same, our first care will undoubtedly be to see that there are none, and our first serious survey projects should start with our boundaries.

If we examine the map of the political boundaries in Africa, given in the November number of the 'Proceedings' of the Royal Geographical Society, we find that we have now approximately:—

	Miles.
A German frontier to the extent of	2400
A Portuguese	1350
A Dutch	1250
A French	500
An Italian	750
An Egyptian	650
Indefinite tribes	1650

Now, admitting that out of this enormous accession to England's boundary responsibilities, comparatively a small portion is likely to involve us in international disputes, it must, I think, be conceded that a close topographical acquaintance with all of them is of the highest political importance. As trade interests gradually develop and the old world history of the consolidation of the stronger powers to the final extinction of the weaker gradually repeats itself, there will be many a crisis in future, as there has been in the past, where the government which possesses the best topographical knowledge will be able to play the stronger hand in the international game. I am purposely ignoring for the present the question of the commercial value of accurate surveys. There can indeed be no question about them, and there are abundant signs that the great companies which are primarily interested in the colonisation of Africa are fully alive to their own interests in this respect. It is to the Imperial interest in African geography that I wish to draw particular attention, as it appears to me that any really satisfactory and comprehensive scheme of survey must depend, in

the first instance, on State support. After all, the diplomat, on matters of demarcation, can do no more than accept the facts laid before him by the geographer. So well do our astute friends, the Chinese, understand this, that at the present moment they are said to have initiated negotiations with our Government for the purpose of arriving at some settlement in regard to the delimitation of the Burma-Chinese frontier. It has been generally supposed that the delay in carrying out one of the provisions of the Convention of 1886 was due to the habitual dilatoriness of the Chinese Government, but this is not so; they are prepared to enter upon such a delimitation at once: they are, however, urging that it is most desirable that certain general principles should be laid down between the two Governments, and details worked out at the convenience of both.

The reason which chiefly moves the Chinese to this course is, that the British, by their surveys and explorations, are acquiring a detailed knowledge of the whole frontier region which the Chinese cannot hope to equal, and they fear that when the time for delimitation comes they will thus be placed at a great disadvantage. They say that the British will be in a position to bargain for that with which they are intimately acquainted, while the other side will have no knowledge of the respective values of these concessions or acquisitions.

As they themselves possess "nobody qualified to investigate thoroughly the region, or to advise them in regard to such points as strategic importance, mineral wealth, commercial advantages, and the like, they desire, now that both parties are in a position more nearly approaching equality than they will be a year or two hence, to have certain general principles laid down by mutual agreement by which both parties will abide ever after." And this general principle seems to be the adoption of a well-marked river boundary. Ethnographical considerations, again, will certainly force their way to the front in the gradual process of colonisation, and they never can be entirely separated from topographical statistics. The progress of colonial development will probably be far more analogous to that which has attended our occupation of India than to the incidents of colonisation elsewhere; as, for instance, in New Zealand or North America, where the aboriginal races have gradually diminished before the advance of the white man. The tendency in Africa, as in Asia, will probably be rather towards increase and immigration into those districts where the Government is popular, and where money is most readily acquired. It will not be long before tribes of savages, about whom we know next to nothing at present, will be bidding for the advantages of free trade and equality in the labour market.

In the absence of better geographical information, it would seem as if our Government had acted on the same principles which apparently govern the Chinese, in adopting large rivers as the most prominent natural features in a country as yet unsurveyed. By the light of the

map to which I have already referred, we find about 2500 miles of boundary defined by such large rivers as the Orange river, the Chobe, the Zambezi, Limpopo, Juba, and Nile tributaries, selected, no doubt, for this important service, because we know more of the hydrography of Africa than of any other branch of its topography.

Large rivers are, however, apt to require more special examination. They may change their courses under the action of certain well-known and not uncommon phenomena, such as a gradual re-distribution of levels; they are strategically defective—a consideration which will, perhaps, carry more weight in future than it does at present; and where they pass through wide alluvial plains they may become the sources of endless litigation (as in the instances of the Indus and the Godavari) from the ever-varying position of their beds and currents. Should there be a highly cultivated riverain tract along their uncertain banks dependent on irrigation derived from the river, there arises again a sure source of dispute as one portion or another passes out of the possibility of irrigation owing to some change in the conditions of water-supply; or, should the river be confined within the limits of a comparatively narrow valley, it will very probably happen that both banks are occupied by the same owners of the soil, and difficulties will arise, increasing in force with the narrowness of cultivable area, which may represent but a small and important oasis in the midst of a wide-spread, barren tract of country.

In the map of Europe we find a few national boundaries formed by rivers which have stood the test of centuries; but the extent of them is but small compared to that furnished by the main mountain ranges of the Continent, where frontiers are guarded by giant chains of white-capped sentinels, who keep watch and ward in the general interests of peace and goodwill amongst such wildly impassable and untrodden heights that no man cares to dispute possession of them. Worse, however, than a river, is that artificial class of boundary which follows no natural feature at all, and which crossing the lines of drainage and dividing the main arteries of a country, jumps from ridge to ridge, and requires every yard of it to be demarcated artificially.

For such a boundary to be permanent in the wild places of the world, where there are no small local interests to preserve the successive links of the chain (such as occur in highly developed and well cultivated countries), nothing short of a continuous artificial landmark, expensively constructed and expensively maintained, can really be effective; a new geographical feature in fact, artificial instead of natural, such as is the Great Wall of China.

That class of boundary, too, which is locally much affected in America, which is defined by meridians, may easily prove a great political stumbling-block when applied internationally. It is unscientific, for it is the application of an absolute quantity to what is really a differential problem.

A boundary should be correctly placed with reference to the topographical features of the district it defines, rather than with reference to Greenwich. It demands that the topography of the district which it outlines should be in the same geodetic terms as itself, right or wrong; otherwise it serves no purpose at all. Thus, owing to the extreme difficulty of fixing absolute longitudes (and this for many years to come must be our method in the interior of Africa), we may get disjointed geography, and a confusion of rival claims when the day of adjustment arrives.

Incomparably the best natural feature to utilise in boundary demarcation is a watershed, whether it be a lofty mountain range or simply a "divide." It usually forms the most useful ethnographical division (a consideration of the first importance), and it carries with it the unquestioned advantage of permanence. It requires no artificial adjuncts to define it, and no expense to maintain it; it is a strategic gain, and it can be readily recognised by the most inexpert aboriginal geographer. This is, after all, the great practical consideration. A boundary should not require a process of discovery. It should stand unmistakable—a solid and substantial warning to all who approach it.

Whatever may be the nature of the 5000 or 6000 miles of indefinite frontier lines adopted in Africa (lines, that is, which follow the course of no great river, and of which the topography is unrecognisable in small-scale maps), it is improbable that they are so defined by accidents of nature as to require no future demarcation, even if our geography be sufficiently advanced to assure us of the correct position of such natural features as may have been adopted.

I may perhaps then safely assume that all our boundary lines want more or less of surveying, and that it will be generally conceded that a gradual survey of our newly acquired African possessions is not merely a matter of private interest designed to improve our present commercial information, and to develop new avenues of trade, but that it is an Imperial measure, demanded in the first instance by the necessity of obtaining a definite outline to our Colonial possessions, and a clear comprehension of the best means of protecting ourselves from that kind of aggression which has already shown some unpleasant symptoms of its existence.

I claim even more than this. An African geographical survey should be not merely a British national measure, but an international undertaking. Not only are our interests identical with those of Germany, France, or Portugal, in the general question of an accurate exposition of the configuration of this hitherto dark continent, but no international boundary demarcation can possibly proceed without the active co-operation of the Governments concerned on both sides.

If then we left the scheme of a gradually developing survey process out of the field of private enterprise, which is absolutely necessary to

ensure unity of design, we may surely appeal to Imperial sources both as to funds and establishment in the initial stages; trusting to the energy of our great companies in future to develop to the utmost that which so nearly concerns their own interests.

Now, what are the Imperial resources which are likely to be most practically effective in such an undertaking as this—vast as it appears at first sight? Perhaps we had better first consider very briefly what we already possess as a substratum on which to build our survey, and then what it is that we require to build on it.

Much indeed as we may justly congratulate ourselves on the magnificent role of historic names connected with African exploration, and conceding all honour to those who have given us an outline of its geography compiled on the results of an infinite amount of patient observation and research, we must admit that it is still *but* an outline, much of which is still vague and conjectural. As for the mapping filled in by our military experts, considering the extent of our military operations in that continent within the last quarter of a century—Ashanti, the Transvaal, Egypt, and the Sudan—we might almost say of them that they have passed away in a magnificent procession of lost opportunities. All that has been done is immensely valuable, but that consists chiefly of the rough sketching of part of the theatre of military operations, with hardly a trace of geographical survey in the true scientific sense of the term. In North-east Africa a part of the great eastern watershed between the Mediterranean and the Red Sea, in Abyssinia, has been mapped, and being connected with the Red Sea coast by direct triangulation, may yet furnish points of departure for further surveys of some of the great Nile tributaries. In the Nile valley itself a revenue survey of part of its lower basin is still, I believe, in progress, and there are the military sketches completed during the Nile expedition; but the opportunity that the great river affords for the commencement of a magnificent meridional series (the finest probably that the world will ever see, for it will surely be measured if the world lasts long enough), has not, so far as I know, been sufficiently appreciated to lead to any systematic triangulation. A meridional series, it should be noted, is always of special value for many reasons, amongst others for the facility with which astronomical checks can be applied to it, to ensure accuracy of measurement. In South Africa there is probably a better developed map record than elsewhere, with a certain amount of data which would largely facilitate extension of survey northwards, but nothing has been commenced in that land of future possibilities which lies between the Limpopo and Zambezi; nothing between the Zambezi and the Lake district; nothing to define with accuracy the details of our Portuguese frontier where rivers appear to enter rather largely into its structure.

Western Africa presents features very different from those of Eastern Africa. Here our interests lie close to those of France, and accurate

demarcation will doubtless ultimately be found necessary, in provision for which we may look to the assistance of our scientific neighbours; but at present, so far as I am aware, we are without either exact surveys or even that basis for them which would be afforded by a sufficiency of well-fixed longitadic values.

In West Africa the peculiarly difficult nature of the country with which the surveyor will have to deal will probably demand special methods suitable to each colony, where each must be dealt with on its own separate merits without regard to any general scheme analogous to that which may be proposed for the eastern side of the continent. The west must indeed be considered apart from the east in the present phase of African geographical knowledge. But neither in the east nor the west is there much to embarrass us in the way of preconceived ideas should we wish to introduce any scheme which would serve to give unity and continuity to the African surveys of the future. We may indeed almost regard the past as a "tabula rasa" and lay our own foundations for such future superstructure as may be adopted.

As regards Eastern Africa, at any rate, there appears to be no reason why we should hesitate to propose the introduction of a system which has proved so successful in Asia, and which may be briefly summarised as the formation of a rigid backbone or framework of triangulation in the first instance, on which to base a rapid and comprehensive extension of small scale mapping hereafter. This system has at least proved itself to possess the twofold advantage of rapidity and economy. Above all things, any system adopted must be cheap. The modern financial bogie has small substance enough to defeat any project that threatens to be expensive, even though it may be possible to prove incontestably that no money laid out on good mapping is money thrown away.

The Indian system is distinctly economical, and I think we can claim for it a fair record of general efficiency, even when compared with the results obtained by our ingenious trans-atlantic cousins. Even did time and space permit, I could but refer shortly to the manner—not to the matter—of our Asiatic surveys. As regards the manner of them, again, I have no intention of carrying you into a maze of technical details. I will only say that the system is practically identical with that of America. The difference, such as there is, consists chiefly of the freer use made by American geographers of the graphic system of triangulation, an application of the plane table which is rendered possible by the comparative equability of atmospheric conditions in their continent, and which is found unsuitable to tropical latitudes. I refer especially to this peculiarity because I observe a growing tendency in this country to purely graphic surveying.

Rather more than twenty years ago I found it difficult to persuade our English surveyors that plane table methods furnished the true key to rapid geographical mapping. Now, however, this instrument

has become so popular, that I think it advisable to remind you that in hot and moist climates plane tabling must be regarded as the end, not as the beginning of practical field-map-making. It can never be made a substitute for the far more accurate and trustworthy preliminary processes of triangulation with the theodolite, combined with subsequent computation and a mathematical record.

It would be the worst of all possible blunders to enter on so magnificent a field as lies before us in Africa, without securing a well-considered, well balanced trigonometrical basis for all future mapping. It should be remembered too that where boundaries do not exist in the form of unmistakable natural features, nothing short of a mathematical definition of them can furnish a lasting record. If we are not furnished with a record of the co-ordinate position in terms of latitude and longitude, at every pillar or artificial mark set up to define the frontier of any wild and uncultivated country, there would be an excellent chance of losing our boundary altogether, and of being compelled to resort to a great scientific process to recover it.

This, then, leads me to the object of my paper—a brief suggestion for a comprehensive scheme which may give practical effect in the shortest possible time to the efforts of the first pioneers in this most magnificent field of East Africa. A slight reference has already been made to a great future possibility—the possibility of a grand meridional series extending in one gigantic arc from Cairo to Natal, approximating in position to the meridian of $30^{\circ} 30'$ E. long., and forming such a geodetic chain as would be a landmark in the field of science for all ages to come. A few years ago such a proposal would have been relegated to a prominent place amongst the wildest conceptions of Jules Verne; even now it will be regarded rather as a scientific dream than a practical possibility. But the possibility is certainly dawning on us, although it may yet be far removed. For we must remember that this is a practical and utilitarian age, and boldly to propose such a scheme as this, involving as it would all the minute accuracy and expensive processes of geodetic surveying, just at a time, too, when it has been decided that we cannot afford the extension of such scientific luxuries in India, is hardly my intention at present. We must begin gently, and it is fortunate for us that the perfection to which certain small and portable classes of alt-azimuth instruments have been brought now places within our reach the means of carrying out a central line or series of triangulations in the course of a few months, which would have taken years to complete a quarter of a century ago.

Instead of our heavy-weight instruments, the highly-finished and cumbersome micrometer theodolites, which have done such excellent service in Asia, we must content ourselves with the little vernier-reading six-inch instruments; instead of elaborate arrangements for base measurement, we must use the steel chain and trust to a multi-

plicity of bases, rather than a multiplicity of observations over one base, to eliminate errors and preserve our lineal accuracy; and we must adhere wherever we can to meridional lines for our triangulation series, in order to secure volumes of easily obtained astronomical checks.

I have endeavoured to show that it is the nature and position of our boundaries that first require practical attention, and I would therefore suggest that it is generally along the boundary that the first line of triangulation should be run. There are, indeed, many reasons for adopting this initial step, into which time does not permit me to enter.

Now the maintenance of the integrity of our boundaries being a national (or rather international) question, I need not hesitate to suggest that assistance in this part of the survey scheme at least should be requested from the State, and permission to draw on whatever resources in equipment or *personnel* are available for imperial duty, either in England or India, impartially.

In these suggestions as to the first triangulation, it will be observed that I am dealing with the question from the practical rather than the theoretical side; yet a study of the map of Africa will show that the meridian of $30^{\circ} 30'$ commends itself to our attention from both points of view. In its African length of about 3400 miles it approximates rather closely to about 1500 miles of international boundary, and thereafter includes about 1700 miles of Nile valley, the practical advantages of a survey of which would be unquestionable.

Thus we should find ourselves, from the very first initial stages of our attempt to introduce scientific geography on a comprehensive scale into Africa, more or less supporting the great theoretical conception of a central meridional arc, and much of our first triangulation might foreshadow its ultimate position, even if constructed in the first place merely to give effect to our boundary demarcation.

I have referred to the Indian system of geographical surveying, as bearing more analogy to that survey of Africa which is surely dawning upon us than any other. The similarity of climatic conditions, the similarity of purpose to be effected, the similarity of the raw material which has yet to be worked up into survey establishment, all point to it as a convenient example to imitate, and it possesses the advantage, which would probably be much demanded in relation to Africa, of leading to quick results. Advantageous as may be a general knowledge of the conformation of a country before stepping into it with a view to triangulation, and helpful as such a knowledge would be by putting into the surveyor's hands the outline at least of a scheme before he commences his observations, yet we have found that it is quite possible to dispense with it. Indeed, beyond the frontiers of India it is our *métier* to plunge straight in *medias res* and to bring our triangulation and our first mapping to almost a simultaneous conclusion. The extension of mapping by plane table processes from the first lines of triangulation would

probably become a matter of private enterprise, devolving on local governments, and local exigencies would decide what surveys should take precedence, and what should be the nature of the mapping. It is at this stage of proceedings that I would call the attention of projectors of African surveys to the cheapness and general efficiency of a system based on native labour. Indeed, I may express my conviction that it is quite hopeless to attempt to deal with the vast project we are considering on any other basis. Native labour must be the mainstay of the whole project.

Regarding the value of results obtained by this means, I can state as the outcome of twenty-five years' experience of it that, were European labour available, I should certainly prefer the native in native territory.

In the field of cadastral or revenue surveys natives are, of course, unequalled as agents, on account of the immense numbers required for, and their peculiar adaptability to, this class of work. For geographical enterprise, however, there is no doubt that higher gifts and qualities are demanded which might seem at first sight to be just those in which natives are held to be most deficient. It is true that for work of this nature men must be selected with care, and trained with patience, but results so far have more than justified the time and pains bestowed on education. Their hereditary qualities of patience and devotion to whatever form of professional work they adopt—their capability of appreciating extreme accuracy (far beyond that of the average European) when once this quality has been developed in them—their powers of endurance under climatic conditions that Europeans could not face—the facility with which they pick up languages and assimilate themselves to the manners and customs of an alien people—all these natural advantages far outweigh the chief failing in natives, which is a want of method and acuteness in general observation, which occasionally renders them deficient as intelligencers. So far as courage is concerned, they are much the same as others. Some will be daunted by nothing, and will develop a most remarkable power of evading difficulties—others will take a circuitous route when a shorter one might suffice.

Remember the conditions under which our native geographers are called to work in Asia; they are always in districts more or less hostile to them and their proceedings, frequently amongst fanatics who would give but short shrift to them and their explorations were they discovered, generally without any protective guarantee or promise of compensation in case of loss; and I think you will agree that there are strong points of resemblance between survey conditions in Asia and what may be required in Africa. It is in facing difficulties where no European would have a chance of survival that the best qualities of the native of India are called out. Even his caste prejudices, strongest of all hindrances to the adoption of foreign customs, may be forgotten, as in the case of one of the best explorers in Mahomedan districts that I

know, who is a devout Hindu. Of sheer tenacity of purpose, again, there is no lack. I can instance a man who not so very long ago went alone on a long geographical pilgrimage which lasted three years.

Subsisting in any way he could, sometimes a slave, sometimes a sheep driver, more rarely as a merchant, occasionally robbed, and nearly always illtreated, he yet managed to stick to his few instruments and his dead reckoning, and turned up at last with an all round record of travel such as has seldom been equalled even in African history. And in these advertising days let me commend their gift of silence. Year by year thousands of miles of fresh Asiatic geography are gathered in by them, until indeed we have to look a little closely to find a really untrodden field for fresh survey, and yet you hear no sound. They do not want to write books about themselves, or their opinions, and they are content to give up that information which has been asked from them by Government, and to take their few handfuls of well-earned rupees, and to disappear, all of them, Hindoos and Mahommedans, Sikhs, Ghurkhas, or Buddhists, to their own homes; or else to sit down quietly to the ordinary routine of official duty, until another opportunity occurs for a fresh start. As to the class of work they accomplish, it bears, of course, the stamp of the professional workman, and as such it would be invidious to compare with it the amateur efforts of untrained travellers.

So much for the native of India; but could a similar survey staff be raised of Africans for Africa? From the small amount of my survey experience in Africa I should say undoubtedly it could; but you must ever bear in mind that the native explorer is a picked man to commence with. It is not every native who shows an aptitude for surveying who will make a geographer, and when discovered, even then there follows a long process of careful and patient training, and finally the true scope of his capabilities must be closely watched, and only that set before him to do which he is fully able to perform.

The higher scientific processes of triangulation are not entrusted to natives in India, nor have they ever proved themselves to be capable administrators or good managers. It was the difficulties and dangers which beset the employment of European surveyors in trans-border regions which led to the invention of the native explorer—the danger especially of political complications arising out of the necessity of retribution in case of disaster; a consideration which might not carry such weight in Africa (at least in these days) as it does in India. But whether or no it may be possible to introduce a very much larger European element into the African surveys of the future than is the case in Asia beyond Indian borders, I am confident that no sensible impression can be made on such a vast unsurveyed area as even the best known parts of Africa present, without recourse to the assistance of natives. In the first instance, and to a certain limited extent, I do not see why the imperial resources of India should not be taxed to assist the

project. Men learn their work in the field chiefly, and natives of India could be lent to teach the field work. The question whether this work would be learnt best in India or in Africa is a matter of detail, which, like an infinite number of other points, would have to be carefully discussed and weighed ere a satisfactory and well considered scheme could be proposed for adoption. I have merely referred to general principles, and that in a way which I fear must appear to you to be all too sketchy for so large a subject. I cannot pretend to carry you into details, and indeed I can but apologise for the faintness of the outline with which I have been able to sketch in my suggestions.

GEOGRAPHICAL NOTES.

Our New Session.—The Session 1891-2 of the Society commences on Tuesday, November 10th. The second meeting will be on Monday, November 23rd, and the third on December 7th. At one of the November meetings Lord Lamington will read a paper on his recent journey in Northern Siam. Subsequently Mr. Hogarth, the companion of Professor W. M. Ramsay in his recent explorations of Asia Minor, will give an account of their joint work in that region. A paper by Mr. W. G. Littledale, on his adventurous journey, accompanied by his wife, across the Pamir from north to south, will be read at an early meeting.

Arrival of Mr. H. H. Johnston's Party on the Shiré.—Letters received from Captain B. L. Selater, R.E., Chief of the Staff to H.M. Commissioner, announce the safe arrival at Chiromo, on the Shiré, on July 17th last, of the expedition sent out to organise the government of the new territory of British Central Africa. The frontier of the new territory had been fixed at the station of a planter named Simpson, on the Shiré below Chiromo. On his arrival at this station Mr. Johnston had found three Portuguese soldiers in possession, although the spot was clearly within the British limits. He had turned the Portuguese out, and hoisted the British flag, and renamed the place "Port Herald." This would now be the new customs' station for British Central Africa.—Chiromo is described as a "splendid situation, on the point between the Ruvo and the Zambezi; very healthy, as there is no marsh near." It had been settled that the Shiré above Chiromo was impracticable for steamers, and Chiromo will therefore, in future, be the head of navigation. It is proposed to make a new road direct from Chiromo to Mount Zomba (where the new capital would be established), and so on to the south-east corner of Lake Nyassa, with a branch to Blantyre and another to Milangi, which was expected to become an important place for coffee-growing. Captain Selater was just leaving Chiromo along with Mr. Johnston, in order to make a preliminary survey for this road. We

may add that the new service of the Union Steamship Company from Natal to Mozambique calls at the Chindi mouth of the Zambezi every six weeks, so that "British Central Africa via Zambezi," is now a sufficient address for any one in the new territory.

Lake Chala, Mount Kilima-njaro.—Mr. Keith Anstruther, who has been for some months a resident at Taveta, in a letter addressed to us from that place, informs us that he has made it a special object to explore this deeply-seated crater lake, disbelieving the universal belief of the natives regarding its inaccessibility. In December last he made his first attempt. He says the lake is close to the western side of the stream called the Lumi on our maps, the correct native name of which is Mfuro, or, in the Masai language, Naromosha. The plains to the east and west of the stream gradually slope down to the neighbourhood of the crater, so much so that on the eastern side there is a steep ascent from the plain to the rim of the funnel, while on the western side the elevation of the rim is only a little above the plain. At the south-western end the crater rises to a peak 200 or 300 feet high; and at the north-western a dry watercourse with wooded banks descends to the crater; it was this latter point that he chose for his descent to the lake on the 19th December. His aneroid gave for the level of the water an altitude 195 feet lower than his camp near the crater rim, or 477 feet above Taveta. A few months afterwards he managed to convey a portion of the sections of a pontoon down the declivity, and, lashing them together, circumnavigated the lake several times, finding the circumference to be at least six miles. On the first of his trips, in April last, he conveyed Mrs. French-Sheldon on her tour of circumnavigation of the lake. In summing up the peculiarities of the lake, Mr. Anstruther says the temperature of the surface-water is only $1\frac{1}{2}^{\circ}$ lower than the atmosphere, and that there is no sandy beach, the rocks on the slope being of volcanic formation, without incrustation of any kind, and that the water-marks show that there have been considerable alterations of level. As there are no gorges on the sides of the funnel, the sudden gusts of wind which pass over the surface were very puzzling to account for; a commotion of water which suddenly appears "from the centre of the lake and as suddenly disappears," and strange currents drawing the raft towards the centre, were also very curious. Fish of different species from those found in the neighbouring stream, and red crabs, inhabit the water, and great numbers of waterfowl "and some swifts" give animation to the solitude. A few skins of aquatic birds and a small monkey, which Mr. Anstruther sent us, on being submitted to Mr. Bowdler Sharpe, of the Natural History Museum, are reported by him to be of very common, widely-distributed species; the birds are of three species, viz. *Phalacrocorax corbo*, *Ph. africanus*, and *Plotus Levallantii*.

Zimbabwe Ruins; Mr. Theodore Bent's Discoveries.—We have received telegraphic news of the result of Mr. Bent's investigations of these

strange buildings up to the end of July. So far he had not met with any inscriptions to show the nationality of the people who constructed them. He had, however, found a great variety of interesting objects: blue and green Persian pottery, bowls, one of large size, and another with a splendid frieze representing a hunting scene—four quaggas, with a hunter driving an arrow into the nearest quagga with one hand, and holding a dog with a leash in the other, and behind the dog two elephants—besides inlaid daggers and a copper blade covered with gold plate. The round wall and tower with which photographs have made us familiar he is convinced are the remains of a temple devoted to phallic worship; in their structure they are unique in the world; the wall in some places is 40 feet high and 16 feet thick, solid to the top, and it shows two periods of construction. All the finds have been made on a hill commanding the tower-temple, where the ruins are still more interesting and wonderful, but of the same age and style of construction and the same ornamentation. At the date of the telegram Mr. Bent had just decided on continuing his researches for another month.

Longitude of Fort Salisbury, Mashona-land.—Mr. F. C. Selous, in a letter just received, gives us the important information that the new Surveyor-General of the Chartered South African Company, Mr. Newdigate, after elaborate chronometric observations, has fixed the longitude of Fort Salisbury at about 15 English miles further west than the position given by Mr. Ellerton Fry, on which the longitudes of the map illustrating Mr. Maund's paper, in the 'Proceedings R.G.S.' for February last, were based. The more easterly longitude was remarked at the time to be in conflict with Mr. Selous's position of Mount Hampden, with which Mr. Newdigate's observations approximately agree. It is Mr. Selous's intention to publish shortly a revised map of Mashona-land, for which he has accumulated a large amount of material, rich in topographical detail, laid down by accurate compass bearings during his many journeys through the country in various directions. Mr. Selous hopes to be able to return to England next summer.

Rectifications on the Gambia.—The Anglo-French Commission for the delimitation of frontiers in Gambia have, in the course of their mission, collected a number of facts of considerable topographical interest, some of which will make necessary an alteration in the maps of this region. The commissioners have, for example, ascertained that the river Gambia figures wrongly on the maps as affording a communication between the Carabane and the Casamance rivers; that, as a matter of fact, there is no watercourse of any kind connecting those two rivers. The labours of the commissioners have already extended over several months, and an indirect but by no means unimportant result of their work will be to supply geographers with accurate information on many points as to which we are at present ill informed.

The Welle-Mobangi.—News has arrived from the Congo of the final solution of what was at one time known as the Welle-Mobangi problem. Captain Van Gèle has now explored the small section of the river which remained untraversed between his own former explorations and the point reached by Junker. Starting from the Falls of Mokwanga, he made his way to Adalla.—Another Belgian officer, Lieut. Milz, has explored the section of the river between Jambir and the mouth of the Bima, a tributary of the latter on its left bank. The exploration of the lower course of the river is now complete from its junction with the Congo to the spot where the Bima joins it.

Survey Work in Baluchistan.—From the last administrative report for Baluchistan, which has just reached England, we see that a good deal of useful survey work has been accomplished in that province. Since the date of the last report 1100 square miles of preliminary triangulation have been carried out in the Pishin valley, in Shorarud as far as the Barak Pass, Ranak and Dulai, while 350 square miles have been triangulated and surveyed round Yusuf Kach and Balozai. A revision has been made of the sheet, on the half-inch scale, embodying the topographical survey of the Bolan Pass and the tracts immediately adjoining, the former survey having been of an inferior quality and partaking more of the nature of a reconnaissance. The Quetta civil station and cantonments have been surveyed on the 16-inch scale, and occupation lists of the civil station have been made out. As regards principal triangulation and its connection with the general Indian system, the chain of triangles originally brought by Mr. M'Nair from the Great Indus series near Dehra Ghazi Khan along the parallel of 30° , has been extended to Quetta, and a junction effected with the Khelat series. Ahmed Ali's reconnaissances in 1889 have practically mapped out the northern part of Baluchistan, previously sketched out by the late Sir Charles MacGregor and Captain Lockhart, while Yusuf Sharif has extended this work further to the west and rendered a still larger outturn of reconnaissance work in Eastern Persia. These latter surveys will be eventually fixed and consolidated by lines of triangulation, which have been already carried westward along the Mekran coast from Karachi, and will probably be extended northwards towards the Persian frontier.

Indian Coast Surveys.—During 1889-90 the Indian surveying steamer *Investigator*, under Commander R. F. Hoskyn, R.N., charted the approaches to the Bassein river and made a plan of Elbow Reach on the scale of 2 inches to the mile. The following stretches of the east coast, amounting to about 142 miles in all, were also surveyed, viz.—Bimlipatam to Bawanapad, with plans of Baruva and Pundi; Bawanapad to Gopalpur with plan of Bimlipatam and Ennore Beacon to Pulicat lighthouse. This survey was recommenced on the 26th of December, 1890, and by March last the coast was completed southwards as far as lat. $16^{\circ} 50' N.$ A new plan of Coconada anchorage, which owing to the action of the Godavari river appears to have altered materially since the last survey in 1882, has been commenced on the scale of $1\frac{1}{2}$ inches to the mile, and is expected to be finished this season.

The *Lawrence*, under Lieut. R. S. Gunn, R.N., sailed from Bombay on the 25th October for the Persian Gulf, and after being joined by the *Comet*, which came down from Bagdad to help her, took up the survey of the Bahmishir and Shat-al-Arab rivers, at the head of the Gulf, on the scale of $1\frac{1}{2}$ inches to the mile. A sketch survey on the 1-inch scale of the Bahmishir river was also made from the *Comet*, as she steamed up to Busrah in one day. On her return to India the *Lawrence* carried out a survey of Verawal on the Kathiawar coast on the 4-inch scale. The natural history report made in connection with the survey is largely a statement of deep-sea work. The work of collection has been much more successful since the use of the reversible trawl and wire rope, and the collections themselves have been arranged so that if it be ever decided to report upon them group by group, this task will be much facilitated by the abundance of material all ready sorted. Dr. Alcock, the surgeon-naturalist to the Survey, says that the entire collection of deep-sea fishes is one of the finest in the world, and that economic results would follow from a careful investigation and comparison of the little-known semi-bathyal fauna of Indian waters with those of the Mediterranean on one hand and the Japanese seas on the other. The whole question of the embryology of the sharks and rays, too, stands in great need of examination, and there is perhaps no part of the world that offers greater facilities for investigation than the Indian coast with its numerous estuaries and deltas. Altogether the season was very productive from a biological point of view, and Dr. Alcock has submitted for consideration an official proposal for the preparation of a fasciculus of twelve quarto plates similar to the *Challenger* Reports, illustrative of Indian bathyal fishes and crustaceans.

A Journey across Sumatra.—An engineer, named Izerman, during the early months of the present year, crossed Sumatra from Padang to Siak. Starting from Padang on the western side of the island, he visited first the coal-fields of Ombilien, then made his way up the Kwantang river to Lœbœ Ambatjand. Leaving the river at this point, he crossed an intervening stretch of country to the Kampar river, and on the 31st of March arrived in the semi-independent sultanate of Siak. The result of his observations is that it is possible to transport the coal at Ombilien from that place to the coast by the river Kwantang, all that is necessary in the way of engineering being to make a short canal to escape the Solok rapids. This is the third time that the island has been crossed from side to side, and M. Izerman passed through some country new to Europeans. Lieut. Schouw Santvoort was the first to cross the island, in 1877, and ten years later Baron de Brenner-Felsach went from the north of the island to the south through the country of the Tobas.

Provisional Totals of the Census of India.—The Indian census was taken on the 26th of February of the present year, and Mr. J. A. Baines, the Census Commissioner, has now succeeded in compiling a provisional series of tables of the results of the numbering of the people in our great Eastern dependency. Great difficulties have had to be met, and the returns from one or two of the outlying States, such as Sikkim, Baluchistan, and the Shan country, are not available for the present summary. Manipur, for obvious reasons, will probably escape enumeration entirely this census, and the Trans-Himalayan portions of the

Punjab are very difficult of access. The figures, subject to these minor corrections, are of great interest, and may best be studied in tabular form. Appended is an abstract of the principal figures for this year's census.

Province.	Area in sq. miles.	Total Population.	Males.	Females.	Persons per square mile.
1. Madras	140,762	35,591,440	17,603,360	17,988,080	253
2. Bombay and Sind	125,394	18,826,820	9,743,060	9,083,760	150
3. Bengal	149,725	70,909,260	35,339,940	35,569,320	474
4. N.W. Provinces and Oudh	106,104	46,931,010	24,306,600	22,624,410	442
5. Punjab	111,016	20,807,020	11,228,270	9,578,750	187
6. Ajmir-Merwara	2,711	541,890	287,940	253,950	200
7. Central Provinces	86,501	10,774,890	5,390,990	5,383,900	125
8. Berar	17,714	2,896,670	1,491,060	1,405,610	164
9. Coorg	1,583	172,630	95,660	76,970	109
10. Assam	46,341	5,424,190	2,791,510	2,631,190	117
11. Lower Burma	87,220	4,569,680	2,415,430	2,154,250	52
12. Upper Burma	68,922	2,984,730	1,430,170	1,554,560	43
Total Continental	943,993	220,430,230	112,123,090	108,304,750	233
13. Aden and Perim	13 ?	41,910	28,900	13,010	..
14. Quetta, &c.	10 ?	26,880	23,540	3,340	..
15. Andamans (Port Blair) ..	12 ?	15,670	13,430	2,240	..
16. Laccadive Islands	80 ?	14,410	6,510	7,900	..
Total Dependencies	115	98,870	72,380	26,490	..
Total British Territory	944,108	220,529,100	112,196,370	108,331,240	234
Feudatory Territory	642,996	66,167,860	34,145,410	31,888,020	111
INDIA	1,587,104	286,696,960	146,341,780	140,219,260	186

Ascent of the Orœfa Jokull, Iceland.—Mr. Frederick W. W. Howell, the enterprising explorer of Iceland, who was foiled by a violent snow-storm in his attempt, in the summer of 1890,* to reach the summit of this difficult peak, has this year been successful. He has telegraphed to us, "Orœfa Jokull ascended, August 17th."

Distribution of Population in the United States in accordance with Altitude.—Mr. Henry Gannett, Geographer of the U.S. Census Office, has recently prepared a bulletin on the above subject, in which he gives some interesting facts. From the table and diagram accompanying the bulletin it is seen that about one-sixth of the people of the country live less than 100 feet above sea-level, namely, along the immediate seaboard and in the swampy and alluvial regions of the south, and that more than three-fourths live below 1000 feet, while below 5000 feet are found nearly 99 per cent. of the inhabitants. At great altitudes there is found only the most trifling proportion. In the area below 500 feet is included nearly all that part of the population which

* Vide 'Proceedings R.G.S.,' 1890, p. 619.

is engaged in manufacturing and in the foreign commerce of the country, and most of that engaged in the culture of cotton, rice, and sugar. East of the 98th meridian the contour of 1500 feet is practically the upper limit of population, all the country lying above that elevation being mountainous. The population between 2000 and 5000 feet is found mainly on the slope of the great western plains. In this region the belt between 2000 and 3000 feet is almost everywhere the debatable ground between the arid region of the Cordilleran plateau and the humid region of the Mississippi valley. Between 4000 and 5000 feet, and more markedly between 5000 and 6000 feet, the population is decidedly in excess of the grade or grades below it. This is mainly due to the fact that the densest settlement at high altitudes in the Cordilleran region is at the eastern base of the Rocky Mountains and in the valleys about Great Salt Lake, which regions lie between 4000 and 6000 feet. Of these, the extensive settlements at the base of the mountains in Colorado are mainly between 5000 and 6000 feet. Above 6000 feet the population, which is confined to the Cordilleran region, is almost entirely engaged in the pursuit of mining, and the greater part of it is located in Colorado, New Mexico, Nevada, and California. While the population is increasing numerically in all altitudes, its relative movement is decidedly toward the region of greater altitudes, and is most marked in the country lying between 1000 and 6000 feet above the sea. The density of population is greatest near the sea-level in that narrow strip along the seaboard which contains the great seaports of the United States. The density diminishes gradually and rather uniformly up to 2000 feet, where the population becomes quite sparse. The average elevation of the country, excluding Alaska, is about 2500 feet. The average elevation at which the inhabitants lived, taking cognisance of their distribution, was 687 feet in 1870; in 1880 it had increased to 739 feet, and in 1890 to 788 feet.

The Sargasso Sea.—In a recent number of Petermann's 'Mittheilungen' Dr. O. Krümmel states the results of his investigations into this interesting marine problem. In the first place, he differs entirely from Humboldt as to the shape of the floating mass of vegetation. The "great bank of Flores and Corvo" is, he says, Humboldt's summing up of the observations made by sailing-vessels passing through the Sargasso Sea on their way from the southern hemisphere to Europe. These followed with slight variations the same course, and their observations were naturally limited in extent. It was on these insufficient data that Humboldt founded his theories as to the size and shape of the Sargasso Sea, but now, by the aid of steam, we are able to arrive at more correct conclusions on these points. On a map which he has prepared Dr. Krümmel has plotted out the general contour of the mass of floating vegetation, and has indicated in what parts of the sea the sargasso is found in the greatest abundance. In shape the Sargasso Sea is a sort of ellipse, the great axis of which almost coincides with the Tropic of

Cancer, while the two foci are near long. 45° and 70° W. Around this central ellipse others are indicated, larger in size, but with the vegetation much less dense. In their general outline they follow with sufficient nearness the course of the prevailing winds. As to the origin of the algæ, Dr. Krümmel is strongly of the opinion that they come from the land—not only from the Gulf of Mexico and the coast of Florida, but from the shores of the Antilles and the Bahamas. The most recent studies with regard to the origin and course of the Gulf Stream tend, he thinks, strongly to support those who assert that the algæ come from the land, and to disprove the contention of those who support the hypothesis of a marine origin. Now that it is settled that the Gulf Stream is not a single narrow stream issuing from the Gulf of Mexico, but an accumulation of converging currents sweeping past the coasts of the Antilles and through the adjoining seas, it is obvious that the quantity of algæ carried away must be much greater than it could have been were the old hypotheses of the origin of the Gulf Stream correct. Dr. Krümmel makes an approximate calculation as to the time occupied by the algæ in reaching the Sargasso Sea. A fortnight after reaching the Gulf proper, the weed would, at the rate of two knots an hour, reach the latitude of Cape Hatteras. From that point its onward motion is slower, and it takes about five months and a half for it to reach west of the Azores. After reaching the Sargasso Sea the weed continues to move slowly, until, becoming heavier as it grows older, it gradually sinks to make way for fresh supplies.

Antarctic Exploration.—The long talked-of expedition from Australia to the South Polar lands has now assumed the title of a "Swedish-Australasian Expedition," and is likely soon to be equipped and despatched. At a meeting held in Melbourne on the 3rd of July last, Captain Pasco, R.N., in the chair, the Report of the Antarctic Exploration Committee was read, in which it was stated that a grant of 1000*l.* had been proposed by the Queensland Government, another of 1366*l.* on condition that the public subscribed 634*l.*, by the New South Wales Government, and a third of 300*l.* by the Government of Tasmania. It remained to be seen what sum the Ministry of Victoria would place upon the estimates. Added to the Swedish donation of 5000*l.*, and a similar sum from Sir Thomas Elder, there remained a balance of 2000*l.* only to be subscribed and ensure the success of the expedition, for the successful carrying out of which Baron Nordenskiöld had stated that 15,000*l.* would be sufficient. At the recent International Congress at Berne a resolution of approval of the proposed expedition and hearty wishes for its success was passed on the reading of a paper on the subject by Admiral Sir Erasmus Ommanney. As a pioneer expedition the project is likely to accomplish most useful work, and its promotion, in face of many obstacles, is highly honourable to the public spirit of our Australian colonies.

The Exhibition at the Berne International Geographical Congress.—Colonel T. H. Holdich, R.E., the delegate of the Indian Government at the late Congress, reports, with regard to the exhibition, that there were admirable contributions from Germany, Belgium, France, Austria, Italy, Sweden, and Spain, illustrating the progress of geographical education in those countries from the earliest times. Russia, the United States, and England were unrepresented in this section, although a few of the best American coast survey and geological maps were subsequently introduced. The American geological survey, it should be noted, is, strictly speaking, geographical in character. Undoubtedly a contribution from England would have been effective in supporting the international character of the exhibition; but whilst a purely educational series of maps and school appliances would have extended the scope of the exhibition, they would have hardly added much that was instructive to the advocates of the far higher class of geographical instruction which obtains in other countries. Similarly a contribution of Indian maps of the Himalaya might have been interesting in the Alpine section, but Indian mountain cartography (regarded from the educational point of view) could certainly not be placed advantageously alongside the artistic productions of France and Switzerland. Beyond the already well known and always interesting display of Alpine cartography, there was nothing in the exhibition demanding close attention from Indian map-makers; no new processes of reproduction were illustrated; no new systems of cartography were exhibited that have not already been fully discussed and utilised in India.

Orthography of Geographical Names.—Colonel Holdich suggests the advisability of forming a committee representing the interests of the India Office, Colonial Office, War Office, and Admiralty, in order to arrive at a definite universal system for English map spelling. There are at present maps published in English (the War Office maps of Egypt for example) which are unintelligible to the ordinary reader. There is not much difference between the Indian orthographic system and that adopted by the Royal Geographical Society and the War Office, for such maps as are prepared in the Intelligence Department, but that difference is important, and should be eliminated. Of all the questions dealt with by the International Congress at Berne, he considers this the one most urgently demanding attention. He is convinced that if a general system were adopted for all English-spelt maps, that system would eventually become the property of all nations. Details are comparatively unimportant, so long as there is a general agreement.

The Prime Meridian.—On this question, which was discussed at the Berne Congress, Colonel Holdich says:—The meridian question, although it is apparently as far from solution as it was previously to the Washington Congress, has certainly advanced far enough to demand

that all English maps should possess a common origin for longitude. At present this is not so, for maps of India and of parts of the bordering countries are published with a longitude value based on an incorrect assumption of the position of the Madras observatory, differing about two and a half minutes from the true Greenwich value; so that, as our mapping extends westward through Persia and eastwards through Burma we become involved in awkward discrepancies. I would venture to suggest that the opinion of the Surveyor-General of India should be consulted as to the advisability of adopting the Greenwich meridian in future for all Indian mapping. I am quite aware of the nature of the reasons which have prevented its adoption hitherto, but since attending this Congress I have come to the conclusion that a continuance of the present system is a grave disadvantage if we wish to persuade other nations to adopt Greenwich as their longitude origin, and that this disadvantage outweighs previous considerations.

Obituary.

Mr. J. R. Werner.—We are grieved to hear of the death of the young African traveller, Mr. John Reinhardt Werner, which event happened at Elmina, on the Gold Coast, on the 16th of August last, at the early age of twenty-nine years. He was known chiefly for his journeys and explorations in the Congo region, and for the work he published in 1889 entitled "A Visit to Stanley's Rear Guard," in which he described the incidents of his extensive travel on the great African river and its tributaries, including a visit to the Stanley camp on the Aruwimi at the time that Major Barttelot and his companions were wearily waiting for news of their leader and for the means of following on his tracks. Mr. Werner's father was a German who had settled in England and died at Tunbridge, where young Werner received his education. He was trained as an engineer, and in this capacity entered the service of the Congo Free State in April 1886. In the course of his duties on the river steamers he made numerous journeys up and down the river. One of these journeys, in October 1886, was undertaken for the purpose of tracing the course of the Ngala, a previously unexplored tributary of the right bank, during which he aided Mr. Baert, of the Free State Service, in exploring and mapping the river. This exploration formed the chief subject of a paper which he read at the Society's meeting of May 13th, 1889, and which was subsequently published in our 'Proceedings.' He had not long landed in West Africa, on his second visit, when the fatal African climate claimed him as another victim. The immediate cause of death was pneumonia.

PROCEEDINGS OF THE GEOGRAPHICAL SECTION
OF THE BRITISH ASSOCIATION.

CARDIFF MEETING, 1891.

THE Geographical Section sat on five days during the Association week, and as a rule the meetings were well attended.

The Committee of the Section was constituted as follows:—

PRESIDENT.—E. G. Ravenstein.

VICE-PRESIDENTS.—Colonel Sir Francis de Winton, R.A., K.C.M.G., C.B.; H. Seebohm, HON. SEC. R.G.S.

SECRETARIES.—John Coles, F.R.A.S.; J. Scott Keltie (*Recorder*); H. J. Mackinder, M.A.; A. Silva White, SEC. R. SCOT. G.S.; Dr. Yeats.

COMMITTEE.—Right Hon. Lord Aberdare, G.C.B., F.R.S.; Prof. Copeland; Prof. Boyd Dawkins, F.R.S.; Dr. R. W. Felkin; Dr. Hugh R. Mill, F.R.S.E.; E. Delmar Morgan; Principal Grant Ogilvie, F.R.S.E.; Colonel T. H. Holdich, R.E.; Dr. J. S. Phené; Trelawney Saunders; Eli Sowerbutts; G. J. Symonds, F.R.S.; Colonel H. Tanner; J. Thomson; C. T. Whitmell; Lewis Williams, J.P.

Thursday, August 20th.

THE PRESIDENT opened the business of the Section by the following address, taking for his subject "The Field of Geography."

It behoves every man from time to time to survey the field of his labours, and to render an account unto himself of the work he has accomplished, and of the tasks which still await him, in order that he may perceive whether the means employed hitherto are commensurate with the magnitude of his undertaking, and likely to lead up to the desired results.

Such a survey of the "Field of Geography" I propose to make the subject of my address to-day. You are aware that this field is a large one, that its boundaries are defined no more precisely than are the boundaries of other fields of human research, and that the fellow-labourers who join us in its cultivation are not always agreed as to the tasks that are peculiarly their own, or as to the methods in accordance with which their work should be carried on. By some of our neighbours we have not infrequently been accused of encroachments, and of overstepping our legitimate boundaries in order to invade adjoining fields already in the occupation of others, who are not only willing to cultivate them, but even claim to be better qualified than we are. There is undoubtedly some truth in this reproach, for, although there have been, and perhaps still are, geographers who would limit their task to a mere description of the earth's surface, there are others, to judge them by their performances, to whom earth and universe, geography and cosmography, are synonymous terms.

If, as a lexicographer, I were merely called upon to define the literal meaning of the word "geography," I should content myself by saying that it meant a "description of the earth." This, however, is merely the translation of a name given to our department of knowledge in an age when all natural science was descriptive, and scientific inquirers were still content to collect facts, without attempting to reduce them to a system. The ancient name, however, has been retained, notwithstanding that our conception of the duties of the geographer has undergone a notable change. The German word "Erdkunde," although too comprehensive, would perhaps be preferable, but could be rendered only by the word

"geology," a term already appropriated to quite a distinct department of science, which has much in common with geography, and may even be described as its offspring, but is most certainly not identical with it.

Very varied have been the views as to what geography should embrace. Whilst Ptolemy would confine the duties of the geographer to the production of a correct map of the earth's surface, others fell into the opposite extreme, and were unable to resist the temptation of embellishing their "systems of geography" with historical excursions, and with information of the most varied kind, only remotely, if at all, connected with their subject. But whilst the geographer should guard, on the one hand, against being drawn away from his legitimate task, he should not, on the other, allow himself to be intimidated by those who, on the pretence of creating a geographical "science," would frighten him away from fields of research which his training enables him to cultivate to greater advantage than can be done by representatives of other departments of knowledge.

But whatever changes may have taken place respecting the aims of the geographer, it is very generally acknowledged that the portraiture of the earth's surface in the shape of a map lies within his proper and immediate domain. And there can be no doubt that a map possesses unique facilities for recording the fundamental facts of geographical knowledge, and that with a clearness and perspicuity not attainable by any other method. You will not, therefore, think it strange if I deal at considerable length with the development of cartography, more especially as my own labours have in a large measure been devoted to that department of geographical work. An inspection of the interesting collection of maps of all ages which I am able to place before you will serve to illustrate what I am about to say on this subject.

You may take it for granted that maps have existed from the very earliest times. We can hardly conceive of Joshua dividing the Promised Land among the twelve tribes, and minutely describing their respective boundaries, without the assistance of a map. The surveyors and land-measurers of the civilised states of antiquity undoubtedly produced cadastral and engineering plans, which answered every practical requirement, notwithstanding that their instruments were of the simplest. This is proved by a plan of Rome, the only document of the kind which has survived, at least in fragments, to the present time. It is engraved on slabs of marble on a scale of 1:300, and was originally fixed against a wall of the Roman Town Hall, so that it might be conveniently consulted by the citizens.

Of the existence of earlier maps of the world or even of provinces, we possess only a fragmentary knowledge. Anaximander of Miletus (634-546 B.C.) is credited among the Greeks with having produced the first map. His countryman Hecataeus the Elder, who had seen many lands, and of whom Herodotus borrowed the terse saying that Egypt was the gift of the Nile, about 500 years before Christ, exhibited to his fellow-citizens a brazen tablet upon which was engraved "a map of the entire circuit of the world, with all its seas and rivers," and pointed out to them the vast extent of the Empire of Darius, with whom they were about to engage in hostilities. But his warning proved in vain, and their disregard of the teachings of geography had, as usual, to be dearly paid for.

That maps grew popular at an early age is proved by Aristophanes, who, in his comedy of "The Clouds," 423 B.C., has a map of the world brought upon the stage by a disciple of the Sophists, who points out upon it the position of Athens and of other places familiar to the audience.

A real advance in cartography was made when Dicaearchus of Messana (390-290 B.C.) introduced the parallel of Rhodes, as a separator between the northern and the southern habitable worlds. This "diaphragm" was intersected at right angles

by parallel lines representing meridians. This system of graduating a map was accepted by Eratosthenes (276-196 B.C.), and appears to have kept its hold upon the more scientific cartographers up to the time of Marinus of Tyre, the immediate predecessor of Ptolemy. Whether the map of the Roman Empire, which Agrippa, the son-in-law of Augustus, caused to be placed under a portico, and which was based upon itinerary surveys begun forty-four years before Christ, was furnished with parallels and meridians we do not know. It probably resembled in appearance some of our mediæval maps, like that of Richard of Haldingham, still preserved in the cathedral of Hereford. Widely different from it were the road-maps or "Itineraria picta" of the Romans, of which "Peutinger's Table" is a well-known example of a late date.

Such, then, were the maps which existed when Ptolemy of Alexandria appeared upon the field, and introduced reforms into the methods of representing the earth's surface which fully entitled him to the foremost place among ancient cartographers, and which inspired his successors when the study of science revived in the fifteenth century.

Ptolemy, like all great reformers, stood upon the shoulders of men who had preceded him, for before a map like his could be produced much preliminary work had been accomplished. Parmenides of Elea (460 B.C.) had demonstrated that our earth was a globe, and Eratosthenes (276-196 B.C.) had approximately determined its size. Hipparchus (190-120), the greatest astronomer of antiquity, the discoverer of the precession of the equinoxes, and the author of a catalogue of stars, had transferred to our earth the auxiliary lines drawn by him across the heavens. He had taught cartographers to lay down places according to their latitude and longitude, and how to project a sphere upon a plane. It is to him we are indebted for the stereographic and orthographic projections of the sphere. Ptolemy himself invented the tangential conical projection.

The gnomon or sun-dial, an instrument known to the Chinese 600 years before Christ, had long been used for the determination of latitudes, and the results were relatively correct, although uniformly subject to an error of 16 minutes, which was due to the observers taking the altitude of the upper limb of the sun, when measuring the shadow cast by their dial, instead of that of the sun's centre.

It was known, likewise, that differences of longitude could be determined by the simultaneous observation of eclipses of the sun or moon, or of occultations of stars, and Hipparchus actually calculated Ephemerides for six years in advance to facilitate computations. Ptolemy himself suggested the use of lunar distances. But so imperfect were the astrolabes and other instruments used by the ancient astronomers, and especially their time-keepers, that precise results are quite out of the question.

Ptolemy, in fact, contented himself with accepting eight latitudes determined by actual observation, of which four were in Egypt, whilst of the three longitudes known to him he only utilised one in the construction of his map. Unfortunately, the one selected proved the least accurate, being erroneous to the extent of 32 per cent., whilst the error of the two which he rejected did not exceed 13 per cent.* This want of judgment, pardonable, no doubt, under the circumstances, vitiated

* The three longitudes are the following:—

	Result of ancient observations.	Adopted by Ptolemy.	Actual difference of longitude.
Arbela	45° E. of Carthage	45°	34°
Babylon	12° 30' E. of Alexandria	18° 30'	14° 18'
Rome	20° W. of Alexandria	23° 50'	17° 24'

Ptolemy's delineation of the Mediterranean to a most deplorable extent, far more so than did his assumption that a degree only measured five hundred stades, when in reality it measures six hundred. For whilst the breadth of his Mediterranean, being dependent upon the relatively correct latitudes of Alexandria, Rhodes, Rome, and Massilia, fairly approximates the truth, its length is exaggerated to the extent of nearly 50 per cent., measuring 62° instead of $41^{\circ} 40'$. This capital error of Ptolemy is due therefore to the unfortunate acceptance of an incorrect longitude, quite as much as to an exaggeration of itinerary distances. It is probable that Ptolemy would have presented us with a fairer likeness of our great inland sea had he rejected observed latitudes and longitudes altogether and trusted exclusively to his itineraries and to such bearings as the mariners of the period could have supplied him with.

No copy of Ptolemy's original set of maps has reached us, for the maps drawn by Agathodæmon in the fifth century are, under the most favourable circumstances, merely reductions of Ptolemy's originals, or they are compiled from Ptolemy's "Geography," which, apart from a few explanatory chapters, consists almost wholly of lists of places, with their latitudes and longitudes.

An examination of Ptolemy's maps shows very clearly that they were almost wholly compiled from itineraries, the greater number of which their author borrowed from his predecessor Marinus. It shows too, that Ptolemy's critical acumen as a compiler cannot be rated very high, and that he failed to utilise much information of a geographical nature which was available in his day. His great merit consisted in having taught cartographers to construct their maps according to a scientific method. This lesson, however, they were slow to learn, and centuries elapsed before they once more advanced along the only correct path which Ptolemy had been the first to tread.

During the "Dark Ages" which followed the dismemberment of the Roman Empire there was no lack of maps, but they were utterly worthless from a scientific point of view. The achievements of the ancients were ignored, and the principle aim of the map-makers of the period appears to have been to reconcile their handiwork with the orthodox interpretation of the Holy Scriptures. Hence those numerous "wheel maps," upon which Jerusalem is made to represent the hub, whilst the western half of the disc is assigned to Europe and Africa, and the eastern to Asia.

As it is not my intention to introduce you to the archaeological curiosities of an uncritical age, but to give you some idea of the progress of cartography, I at once pass on to the Arabs.

The Arabs were great as travellers, greater still as astronomers, but contemptible as cartographers. Their astronomers, fully possessed of the knowledge of Ptolemy, discovered the error of the gnomon, they improved the instruments which they had inherited from the ancients, and carefully fixed the latitudes of quite a number of places. Zarkala, the Director of the Observatory of Toledo, even attempted to determine the difference of longitude between that place and Bagdad; and if his result differed to the extent of three degrees from the truth, it nevertheless proved a great advance upon Ptolemy, whose map exhibits an error amounting to eighteen degrees. Had there existed a scientific cartographer among the Arabs, he would have been able, with the aid of these observations and of the estimates of distances made by careful observers like Abul-Hasan, to effect most material corrections in the map of the known world. If Edrisi's map (1154) is better than that of others of his Arab contemporaries, this is simply due to his residence at Palermo, where he was able to avail himself of the knowledge of the Italians.

Quite a new epoch in the history of cartography begins with the introduction

of the magnetic needle into Europe. Hitherto the seaman had governed his course by the observation of the heavens; thenceforth an instrument was placed in his hands which made him independent of the state of the sky. The property of the magnet or "loadstone" to point to the north first became known in the eleventh century, and in the time of Alexander Neckam (1185) it was already poised upon a pivot. It was, however, only after Flavio Gioja of Amalfi (1302) had attached to it a compass-card, exhibiting the direction of the winds, that it became of such immediate importance to the mariner. It is only natural that the Italians, who were the foremost seamen of that age, should have been the first to avail themselves of this new help to navigation. At quite an early date, as early probably as the twelfth century, they made use of it for their maritime surveys, and in course of time they produced a series of charts upon which the coasts frequented by them, from the recesses of the Black Sea to the mouth of the Rhine, are delineated for the first time with surprising fidelity to nature. The appearance of these so-called compass-charts, with gaily coloured roses of the winds and a bewildering number of rhumb-lines, is quite unmistakable. A little consideration will show you that if the variation of the compass had been taken into account in the construction of these charts, they would actually have developed into a picture of the world on Mercator's projection. But to deny them all scientific value because they do not fulfil this condition is going too far. As correct delineations of the contours of the land they were a great advance upon Ptolemy's maps, and it redounds little to the credit of the "learned" geographers of a later time that they rejected the information so laboriously collected and skilfully combined by the chart-makers, and return to the deformities of Ptolemy. The adjustment of these charts to positions ascertained by astronomical observations could have been easily effected. An inspection of my diagrams will prove this to you. The delineation of Italy, on the so-called Catalan map, is surprisingly correct; whilst Gastaldo, whose map of Italy is nearly two hundred years later, has not yet been able to emancipate himself from the overpowering authority of Ptolemy. And in this he did not sin alone, for Italian and other cartographers of a much later time still clung pertinaciously to the same error.

There were others, however, who recognised the value of these charts, and embodied them in maps of the entire world. Among such were Marino Sanuto (1320) and Fra Mauro (1453), both of whom made their maps the repository of much information gathered from the Arabs or from their own countrymen who had seen foreign parts. Fra Mauro, more especially, has transmitted to us a picture of Abyssinia marvellously correct in its details, though grossly exaggerated in its dimensions.

Another step in the right direction was taken when the cartographers and pilots of Portugal and Spain returned to the crude projection of Dicæarchus, Eratosthenes, and Marinus, which enabled them to lay down places according to latitude and longitude upon their "plane charts."

Germany, debarred from taking a share in the great maritime discoveries of the age, indirectly contributed to their success by improvements in mathematical geography and the introduction of superior instruments. The navigators of the early middle ages still made use of an astrolabe when they desired to determine a latitude, but this instrument, which in the hands of an expert observer furnished excellent results on land, was of little use to a pilot stationed on the unsteady deck of a vessel. Regiomontanus consequently conferred an immense service upon the mariners of his time when, in 1471, he adapted to their use an instrument already known to the ordinary surveyors. It was this cross staff which Martin Behaim introduced into the Portuguese navy, and which quickly made its way among the

navigators of all countries. Most observations at sea were made with this simple instrument, variously modified in the course of ages, until it was superseded by Hadley's sextant. In the hands of the more skilful navigators of the seventeenth century, such as Baffin, James, and Tasman, the results obtained with the cross-staff were correct within two or three minutes.



Far greater difficulties were experienced in the observations of longitudes. Lunar eclipses were most generally made use of, but neither the Ephemerides of Regiomontanus, for the years 1474 to 1506, which Columbus carried with him on his voyages, nor those of Peter Apianus, for 1521-70, were sufficiently accurate to admit of satisfactory results, even though the actual observation left nothing to be desired. Errors of 30 degrees in longitude were by no means rare, and it was only when Kepler had published his 'Rudolphine Tables' (1626), which according to Lalande formed the basis of all astronomical calculations during a century, that more exact results were obtained. The suggestion to determine longitude by means of lunar distances or occultations of stars bore no fruit at that time, as the knowledge of the complicated motion of the moon was still very imperfect. Still less was known about the movements of the satellites of Jupiter which Galileo had first espied in 1610 when looking at that planet through his telescope. They became available only after tables of their revolutions and eclipses had been published by Cassini in 1668.

Another suggestion for the determination of longitude was made by Gemma Frisius in 1530, namely, that a clock or timekeeper should be employed for the purpose. One of Huygens's pendulum clocks was actually carried by Holmes to the Gulf of Guinea, but the results obtained were far from encouraging.

The difficulties which still attended the determination of longitude in the sixteenth century are conspicuously illustrated by the abortive attempts of a Congress of Spanish and Portuguese navigators who met at Badajoz and Yelves in 1524 for the purpose of laying down the boundary line, which Pope Alexander VI. had drawn at a distance of 370 Spanish leagues to the west of Cape Verde Islands,

to separate the dominions of Spain from those of Portugal. Not being able to agree either as to the length of a degree, nor even as to that of a league, they separated without settling the question placed before them.

So uncertain were the results of observations for longitude made during the sixteenth and seventeenth centuries, that it was thought advisable to trust to the results of dead-reckoning rather than to those of celestial observations. But the method of dead-reckoning is available only when we have a knowledge of the size of the earth, and this knowledge was still very imperfect, notwithstanding the renewed measurement of an arc of the meridian by Snellius, the Dutch mathematician (1615). This measurement, however, is remarkable on account of its having for the first time applied the exact method of triangulation to a survey.

The problem of measuring the ship's way had been attempted by the Romans, who dragged paddle-wheels behind their ships, the revolutions of which enabled them to estimate the distance which the ship had travelled. But time, the strength of the wind, and the pilot's knowledge of the qualities of his ship, still constituted the principal elements for calculations of this kind, for the "*catena a poppa*" which Magellan attached to the stern of his ship was merely intended to indicate the ship's leeway and not the distance which it had travelled. The log, which for the first time enabled the mariner to carry out his dead-reckoning with confidence, is first described in Bourne's "*Regiment for the Sea*," which was published in 1577.

The eminent position which Italian cartographers occupied during the fourteenth and fifteenth centuries had to be surrendered by them, in the beginning of the sixteenth, to their pupils, the Portuguese and Spaniards, upon whom extensive voyages and discoveries had conferred exceptional advantages. These, in turn, had to yield to the Germans, and later on to the Dutch, who were specifically qualified to become the reformers of cartography by their study of mathematics and of the ancient geographers, as also by the high degree of perfection which the arts of engraving on wood and copper had attained among them. German mathematicians first ventured to introduce the long-neglected geographical projections of Hipparchus and Ptolemy, and devised others of their own. Werner of Nürnberg (1514) invented an equivalent heart-shaped projection, whilst both Apianus and Staben (1520 and 1522) suggested equivalent projections. Still greater were the services of Gerhard Cremer, or Mercator (1512-94), the Ptolemy of the sixteenth century, who not only introduced the secant conical projection, but also invented that still known by his name, which was calculated to render such great service to the navigator, but was nevertheless not universally accepted until the middle of the sixteenth century, when the mediæval compass and plane charts finally disappeared.

The German cartographers of that age are to be commended, not because they copied Ptolemy's maps—for in this they had been preceded by others—but because they adopted his scientific methods in producing maps of their own. Their reforms began at home, as all reforms should. They were amply supported in their efforts by the many astronomers of note of whom Germany then boasted, and by quite a staff of local "geographers," of whom nearly every district of the empire boasted the possession of one. Among these local maps, that of Bavaria, by Philipp Bienewitz, or Apianus (1566), holds a distinguished place, for it is the first map on a large scale (1:144,000) based upon a regular survey. Its errors in latitude do not exceed 1', and those in longitude 3', which is marvellously correct considering the age of its production. Like most maps of the period, it is engraved on wood, for though the art of engraving on copper was invented in Germany before 1446, and the first map was engraved there in 1450, copper engraving only became general at a much later date.

Perhaps the earliest general map of Germany, and certainly one of the most interesting, was that which the famous Cardinal Nicolas of Cues or Cusa completed in 1464, the only existing copy of which is to be found in the British Museum, where it was "discovered" by Baron Nordenskjöld. Mercator's map of Germany, published more than a century after that of the learned Cardinal (in 1585), was naturally far more complete in all respects, and was certainly far superior to the maps of any other country existing at that time. This fact is brought home to us by an inspection of a collection of maps to be found in the well-known *Theatrum Orbis* of Ortelius (first published in 1570), where we may see that the maps supplied by Humphrey Lloyd and other British cartographers are still without degree lines.

But when we follow Mercator or, in fact, any other cartographer of the period, into regions the successful delineation of which depended upon an intelligent interpretation of itineraries and of other information collected by travellers, they are found to fail utterly. Nowhere is this utter absence of the critical faculty more glaringly exhibited than in the maps of Africa of that period.

Among the Dutch cartographers of that age one of the foremost places must be accorded to Waghenaeer of Enkhuysen, whose 'Mirror of the Sea,' a collection of charts published in 1583, enjoyed a considerable reputation among British seamen. Other famous Dutch publishers of charts were Ortelius, Janssen, Blaeuw, and Vischer, who accumulated large stocks of copper plates, which constituted valuable heirlooms, and, not unlike the plates of certain modern map-publishers, supplied edition after edition without undergoing any change, except perhaps that of the date.

The age of great discoveries was past. All blanks upon our maps had not yet been filled up, but the contours of the great continents stood out distinctly, and in the main correctly. Discoveries on a large scale had become impossible, except in the Polar regions and in the interior of some of the continents; but greater preciseness had to be given to the work already done, and many details remained to be filled in. In this "Age of Measurements," as Peschel significantly calls it, better instruments, and methods of observation superior to those which had sufficed hitherto, were needed, and were readily forthcoming.

Picard, by making use of the telescope in measuring angles (1667), obtained results of a degree of accuracy formerly quite unattainable, even with instruments of huge proportions. For the theodolite, that most generally useful surveying instrument, we are indebted to Jonathan Sisson (1737 or earlier). More important still, at all events to the mariner, was the invention of the sextant, generally ascribed to Hadley (1731), but in reality due to the genius of Newton. Equally important was the production of a trustworthy chronometer by John Harrison (1761), which first made possible the determination of meridian distances, and is invaluable whenever a correct knowledge of the time is required. One other instrument, quite recently added to the apparatus of the surveyor, is the photographic camera, converted for his special benefit into a photogrammeter. This instrument can perhaps never be utilised for ascertaining the relative positions of celestial bodies, but has already done excellent service in ordinary surveying, especially when it is required to portray the sides of inaccessible mountains.

But the full fruits of these inventions could be enjoyed only after Bradley had discovered the aberration of light (1728) and the nutation of the earth's axis (1747); Dominique Cassini had furnished trustworthy tables of the refraction of light; and the complicated movement of the moon had been computed by Euler (1746), Tobias Mayer (1753), Bradley (1770), and, more recently by Hansen.

Positively novel methods for determining the latitude and longitude of a place

can scarcely be said to have been proposed during this period, but many of the older methods only became really available after the improvements in the instrument indicated above had taken place, and the computations had been freed from the errors which vitiated them formerly.

Real progress, however, has been made in the determination of altitudes. Formerly they could be ascertained only by trigonometrical measurement, or by a laborious process of levelling, but since physicists have shown how the decrease of atmospheric pressure with the altitude, and the boiling-point of water depending upon this decrease, afforded a ready means of determining heights, the barometer, aneroid, and boiling-point thermometer have become the indispensable companions of the explorer, and our knowledge of the relief of the land has advanced rapidly.

Equally rapid have been the improvements in our instruments for measuring the depth of the ocean, since a knowledge of the configuration of its bed was demanded by the practical requirements of the telegraph engineers.

And in proportion as the labours of the surveyors and explorers gained in preciseness, so did the cartographer of the age succeed in presenting the results achieved in a manner far more satisfactory than had been done by his predecessors. His task was comparatively easy so long as he only dealt with horizontal dimensions, though even in the representation of these a certain amount of skill and judgment are required to make each feature tell in proportion to its relative importance. The delineation of the inequalities of the earth's surface, however, presented far greater difficulties. The mole-hills or serrated ridges, which had not yet quite disappeared from our maps in the beginning of this century, failed altogether in doing justice to our actual knowledge. The first timid attempt to represent hills as seen from a bird's-eye view, and of shading them according to the steepness of their slopes, appear on a map of the Breisgau, published by Homann in 1718. We find this system fully developed on La Condamine's map of Quito, published in 1751, and it was subsequently popularised by Arrowsmith. In this crude system of hill shading, however, everything was left to the judgment of the draughtsman, and only after Lehmann (1783) had superimposed it upon a groundwork of contours, and had regulated the strength of the hatching in accordance with the degree of declivity to be represented, did it become capable of conveying a correct idea of the configuration of the ground.

The first to fully recognise the great importance of contours was Philip Buache, who had prepared a contoured map of the Channel in 1737, and suggested that the same system might profitably be extended to a delineation of the relief of the land; and this idea, subsequently taken up by Ducarla, of Vabres, was for the first time carried into practice by Dupain-Triel, who published a contoured map of France in 1791. Up to the present time more than eighty methods of showing the hills have been advocated, but it may safely be asserted that none of these methods can be mathematically correct unless it is based upon horizontal contours.

The credit of having done most towards the promotion of cartography in the course of the eighteenth century belongs to France. It was France which first equipped expeditions to determine the size of the earth; France, which produced the first topographical map based upon scientific survey—a work begun by César François Cassini in 1744, and completed by his son five years after his father's death; it was France again which gave birth to D'Anville, the first critical cartographer the world had ever seen.

Delisle (1675–1726), a pupil of Cassini's, had already been able to rectify the maps of the period by utilising the many astronomical observations which French

travellers had brought home from all parts of the world. This work of reform was carried further by D'Anville (1697-1782), who swept away the fanciful lakes from off the face of Africa, thus forcibly bringing home to us the poverty of our knowledge; who boldly refused to believe in the existence of an Antarctic continent covering half the southern hemisphere, and always brought sound judgment to bear upon the materials which the ever-increasing number of travellers placed at his disposal. And whilst France led the way, England did not lag far behind.

In that country the discoveries of Cook and of other famous navigators, and the spread of British power in India, gave the first impulse to a more diligent cultivation of the art of representing the surface of the earth on maps. There, to a greater extent than on the Continent, the necessities of the navigator called into existence a vast number of charts, amongst which are many hundreds of sheets published by Dalrymple and Joseph Desbarres (1776). Faden, one of the most prolific publishers of maps, won distinction especially for his county maps, several of which, like that of Surrey by Linley and Gardner, are based upon trigonometrical surveys carried on by private individuals. England was the first to follow the lead of France in undertaking a regular topographical survey (1785). Nor did she lack critical cartographers. James Rennell (born 1742) sagaciously arranged the vast mass of important information collected by British travellers in India and Africa; but it is chiefly the name of Aaron Arrowsmith (died 1823) with which the glory of the older school of English cartographers is most intimately connected. Arrowsmith became the founder of a family of geographers, whose representative in the third generation, up to the date of his death in 1873, worthily upheld the ancient reputation of the family. Another name which deserves to be gratefully remembered is that of John Walker, to whom the charts published by our Admiralty are indebted for that perspicuous, firm, and yet artistic execution which, whilst it enhances their scientific value, also facilitates their use by the mariner.

Since the beginning of the present century Germany has once more become the headquarters of scientific cartography; and this is due as much to the inspiring teachings of a Ritter and a Humboldt as to the general culture and scientific training, combined with technical skill, commanded by the men who more especially devoted themselves to this branch of geography, which elsewhere was too frequently allowed to fall into the hands of mere mechanics. Men like Berghaus, Henry Kiepert, and Petermann, the best-known pupil of the first of these, must always occupy a foremost place in the history of our department of knowledge. Berghaus, who may be truly described as the founder of the modern school of cartography, and who worked under the immediate inspiration of a Ritter and a Humboldt, presented us with the first comprehensive collection of physical maps (1837). Single maps of this kind had, no doubt, been published before—Kircher (1665) had produced a map of the ocean currents, Edmund Halley (1686) had embodied the results of his own researches in maps of the winds and of the variation of the compass, whilst Ritter himself had compiled a set of physical maps—but no work of the magnitude of Berghaus's famous Physical Atlas had seen the light before. Nor could it have been published even then had it not been for the unstinted support of a firm like that of Justus Perthes, already the publisher of Stieler's Atlas (1817-23), and subsequently of many other works which have carried its fame into every quarter of the globe.

And now, at the close of this nineteenth century, we may fairly boast that the combined science and skill of surveyors and cartographers, aided as they are by the great advance of the graphic arts, are fully equal to the production of a map which shall be a faithful image of the earth's surface. Let us imagine for one moment that an ideal map of this kind were before us, a map exhibiting not merely

the features of the land and the depth of the sea, but also the extent of forests and of pasture-lands, the distribution of human habitations, and all those features the representation of which has become familiar to us through physical and statistical atlases. Let us then analyse the vast mass of facts thus placed before us, and we shall find that they form quite naturally two well-defined divisions—namely, those of physical and political geography, whilst the third department of our science, mathematical geography, deals with the measurement and survey of our earth, the ultimate outcome of which is the production of a perfect map.

I shall abstain from giving a laboured definition of what I consider geography should embrace, for definitions of this kind help practical workers but little, and will never deter any one who feels disposed and capable from straying into fields which an abuse of logic has clearly demonstrated to lie outside his proper domain. But I wish to enforce the fact that topography and chorography, the description of particular places or of entire countries, should always be looked upon as integral portions of geographical research. It is they which furnish many of the blocks needed to rear our geographical edifice, and which constitute the best training school for the education of practical geographers, as distinguished from mere theorists.

That our maps, however elaborate, should be supplemented by descriptions will not even be gainsaid by those who are most reluctant to grant us our independent existence among the sciences which deal with the earth and its inhabitants. This concession, however, can never content us. We cannot allow ourselves to be reduced to the position of mere collectors of facts. We claim the right to discuss ourselves the facts we have collected, to analyse them, to generalise from them, and to trace the correlations between cause and effect. It is thus that geography becomes comparative; and whilst comparative physical geography, or morphology, seeks to explain the origin of the existing surface features of our earth, comparative political geography, or anthro-geography, as it is called by Dr. Ratzel—one of the most gifted representatives of geographical science in Germany—deals with man in relation to the geographical conditions which influence him. It is this department of geography which was fruitfully cultivated by Karl Ritter.

Man is indeed in a large measure "the creature of his environment," for who can doubt for a moment that geographical conditions have largely influenced the destinies of nations, have directed the builders of our towns, determined the paths of migrations and the march of armies, and have impressed their stamp even upon the character of those who have been subjected to them for a sufficiently extended period.

The sterile soil of Norway, bordering upon a sea rich in fish, converted the Norwegians first into fishermen, and then into the bold mariners who ravaged the shores of Western Europe and of the Mediterranean, and first dared to cross the broad waves of the Atlantic. Can it be doubted that the uniformly broad plains of Eastern Europe contributed largely to the growth of an empire like that of Russia, stretching from the Arctic to the Black Sea; or that the more varied configuration of Western and Southern Europe promoted the development of distinct nationalities, each having a history of its own, and presenting individual traits which characteristically mark it off from its neighbours?

The intelligent political geographer cannot contemplate the great river systems of the continents without becoming aware that their influence has been very diverse, and is not solely dependent upon size or volume. The rivers of Siberia, ice-bound during the greater part of the year, run to waste into an inhospitable ocean, which even our modern resource of steam has failed to render really accessible. They contrast very unfavourably, notwithstanding their huge size, with the

far smaller rivers of Northern Europe, which open freely into the sea and afford navigable highways into the very heart of the continent. And these European rivers, fed as they are by rains falling in all seasons, and by the ice stored up in the recesses of the Alps, again differ very widely in their character from the rivers of tropical regions, dependent upon an intermittent supply of rain. Again, who can look upon such mighty rivers as the Amazons and Mississippi without becoming conscious of the fact that they have given geographical unity to regions of vast extent, which, had their drainage been different, would have presented all the variety which we meet with in Europe—a variety which has proved so favourable to the progress of human culture and civilisation?

It is an old remark that climatic conditions exercise a most powerful influence upon man, and that the development of countries, where Nature yields the necessities of life without requiring a serious effort on the part of the inhabitants, has been very different from those whose climatic conditions compel the putting forth of a certain amount of well-directed energy to make life bearable, or even possible.

These instances of the dependence of human development upon natural resources and geographical features might be multiplied, and their study must at all times be profitable and instructive. It must not, however, be assumed for one moment that this dependence of man upon Nature is absolute. The natural resources of a country require for their full development a people of energy and capacity; and instances in which they have been allowed to lie dormant, or have been wasted, are numerous. What were America and Australia as long as they remained only the homes of the wandering savages who originally inhabited them; and what has become of certain countries of the East, at one time among the most flourishing regions of the earth, but presenting now a most deplorable picture of exhaustion and decay? The geographer must not shut his eye to the fact that the existing state of affairs is not merely the outcome of given geographical conditions and natural resources, but has in a large measure been brought about by man's conquests over the forces of Nature. We do not exaggerate, for instance, when we assert that the introduction of steam as a motive force has largely changed the geographical relations of countries. By facilitating intercourse between distant regions, and encouraging travel, it has tended to uniformity among nations, and rendered available for the common good resources which otherwise must have lain fallow. A tunnel, such as that under the Saint Gotthard, may not have "abolished" the Alps, but it certainly has brought the populations who occupy their opposite slopes nearer to each other, and has given a new direction to commerce.

Perhaps one of the most instructive illustrations of the complex human agencies which tend to modify the relative importance of geographical conditions is presented to us by the Mediterranean. The time when this inland sea was the centre of civilisation and of the world's commerce, whilst the shores of Western Europe were only occasionally visited by venturesome navigators or conquering Roman hosts, does not lie so very far behind us. England, at that period, turned her face towards Continental Europe, of which it was a mere dependency. The prosperity of the Mediterranean countries survived far into the middle ages, and Italy at one time enjoyed the enviable position of being the great distributor of the products of the East, which found their way across the Alps into Germany, and through the gates of Gibraltar to the exterior ocean. But a change was brought about, partly through the closing of the old Oriental trade routes, consequent upon the conquests of the Turks, partly through the discovery of a new world and of a maritime highway to India. When Columbus, himself an Italian, returned from the West Indies in 1493, and Vasco da Gama brought the first cargo of spices from India in 1499, the star of Italy began to fade. And whilst the spices of the Indies and the gold of

Guinea poured wealth into the lap of Portugal, and Spain grew opulent on the silver mines of Mexico and Peru, Venice was vainly beseeching the Sultan to reopen the old trade route through the Red Sea. The dominion of the sea had passed from Italy to Spain and Portugal, and passed later on to the Dutch and English. But mark how the great geographical discoveries of that age affected the relative geographical position of England! England no longer lay on the skirts of the habitable world—it had become its very centre. And this natural advantage was enhanced by the colonial policies of Spain and Portugal, who exhausted their strength in a task far beyond their powers, took possession of tropical countries only, and abandoned to England the less attractive but in reality far more valuable regions of North America. England was thus enabled to become the founder of real colonies, the mother of nations; and her language, customs, and political institutions found a home in a new world.

And now, when the old highway through the Red Sea has been reopened, when the wealth flowing through the Canal of Suez is beginning to revivify the commerce of Italy, England may comfort herself with the thought that in her own colonies and in the states which have sprung up across the Atlantic, she may find ample compensation for any possible loss that may accrue to her through geographical advantages being once more allowed to have full play.

I am afraid I have unduly tried your patience. I believe you will agree with me that no single individual can be expected to master all those departments which are embraced within the wide field of geography. Even the master-mind of a Humboldt fell short of this, and facts have accumulated since his time at an appalling rate. All that can be expected of our modern geographer is that he should command a comprehensive general view of his field, and that he should devote his energies and capacities to the thorough cultivation of one or more departments that lie within it.

The following papers were then read:—

The Art of Observing. By JOHN COLES.—In this paper the art of observing with portable instruments, for latitude and longitude, was described, as well as the use of such simple surveying instruments as the plane table and prismatic compass. The different methods suitable to explorers of fixing positions by astronomical observations were explained, and the manner in which they may be taken so as to eliminate errors was pointed out. The latter part of the paper dealt with surveying, fixing heights by barometer, route surveying in a jungle or forest, and it concluded with some remarks on Mercator's projection in cases where it is required to lay down bearings, &c., or plot a route. The author also called attention to the fact that such instruments as the plane table and prismatic compass might be used with advantage in schools, and that such practical teaching in the field could not fail to give pupils a more intimate knowledge of the principle on which maps are constructed and surveys carried out than they could gain in any other way.

Recent Progress of Geographical Education in England. By J. SCOTT KELTIE.—The author referred to the various efforts made during the past twenty-five years by the Royal Geographical Society to improve the position of geography in education, and to raise the prevailing conception of the subject. He spoke in some detail of the results of the efforts begun in 1834. He pointed out the improved position of the subject in elementary and normal schools; he showed that even in middle class and our great public schools, the subject is now treated with more respect than was formerly the case; but the Society had specially to congratulate itself on the fact that it had succeeded in obtaining recognition of the subject in the universities of Oxford and Cambridge. The author also referred to the efforts of the

Manchester and Scottish Geographical Societies, and to the fact that the prevailing conception of the subject has been greatly elevated, and that in various ways geography was now recognised in this country as a valuable handmaid to science, history, politics, and commerce.

Why are the Prairies treeless? By MILLER CHRISTY.—This paper will be published in full.

The Homology of Continents. By H. ROBERT MILL, D.Sc.—This paper will be published separately.

The Comparative Value of African Lands. By A. SILVA WHITE.—This paper explained the principles on which a novel map of Africa has been designed by the author to illustrate (1) areas of highest resistance against the European domination, (2) areas of highest relative value to the European Powers, and (3) the intermediate or transitional regions. A free reading of the map shows the lines of least resistance against the European domination in Africa.

Friday, August 21st.

On Acclimatisation. By ROBERT W. FELKIN, M.D.—The author pointed out that the subject of acclimatisation increased in importance every year, and during the past few years many papers had been read in reference to it. There are two schools of thought, the one regarding acclimatisation in certain Tropical regions as impossible, the other more sanguine and pronouncing it possible. Probably the truth would be found to be a mean between the two. In considering the subject, it is necessary to specify, first, the various nations who are to be acclimatised, and secondly, the places where they are to be located. As regards the first point, the national characteristics, habits, customs, and environment must be taken into account, and with respect to the second, the nature of the country, its climatology, its inhabitants, their mortality and endemic diseases must be brought under survey. The next point is to classify the various European nations, and it becomes evident that they can only become readily acclimatised in the temperate zone, where climatic and other conditions are approximately akin to their present habitat. In reference to Europeans becoming acclimatised in the Tropics, what are those factors which prevent it or which must be overcome before it is possible? They are as follows:—Heat, cold, damp, various endemic diseases, especially malaria, and those constitutional conditions induced by climate which either destroy the immigrants or diminish their fertility after one or two generations. Progress has been made during recent years in enabling persons to reside longer and to enjoy greater health in the Tropics. What probability is there that science will accomplish still more in rendering acclimatisation possible for Europeans in tropical countries?

Changes in Coast Lines. By J. S. PHÉNÉ.—Dr. J. S. Phéné pointed out that the change in the configuration of the coast lines of the earth exceeded even the large estimate of those who attributed so much to erosion by rivers, glaciers, and general aqueous causes. The contiguous currents in the Gulf of Florida, which originated the Gulf Stream, attested by the results of their operation decades of millions of years; and the configuration of what were now the British Islands appeared mainly due to that influence.

Morocco as a Field for Geographers. By J. E. BUDGETT MEAKIN.—The author said that, though so close to Europe, Morocco is hardly better known to-day than it was three centuries ago. Though a vast change has come over the position of Europeans in that empire, they have been slow to take advantage of their opportunities. Only a small portion of the country is at all fairly known, and on the

whole it may be considered, not only for the geographer, but for all scientists, as virgin soil. Only one traveller has explored the famous Atlas to any extent, and given to the world satisfactory maps and other topographical data. This is the Baron de Foucauld, who travelled some years ago in the disguise of a Jewish Rabbi. The failure of all others who have attempted this task has been due to their unsuitability, chiefly arising from their ignorance of the people and the language. The only authority with regard to the flora and geology of any portion of the highlands is the work of Hooker and Ball. Some of the Christian slaves of bygone centuries have left us valuable itineraries, but the sum of all that has been accomplished is, after all, very meagre. There is no reliable map of Morocco, the only real attempt having been made by Captain Baudouin, for the French War Office, in 1848. This is compiled partly from actual observation and the records of travellers, but for the most part depends on the vague information of natives. The configuration of the Atlas is considerably different from that shown on most maps. Instead of one long chain stretching in a south-westerly direction, it is in reality composed of three more or less parallel lines, which are best defined as the Medium, the Great, and the Lesser Atlas; the first named being the northernmost, and the last bordering on the Sahara. Of these only the centre of the Great Atlas has been to any extent explored.

The Aborigines of Western Australia. By Miss E. M. CLERKE.—This was largely an account of the results of the labours of the Roman Catholic missionaries among the natives of Western Australia.

The Application of Indian Geographical Survey Methods to Africa. By Lieut.-Colonel T. H. HOLDICH, R.E.—Published *in extenso* in the present No. of the Proceedings, *ante*, p. 596.

Bar-Subtense Survey. By Colonel HENRY TANNER, Indian S.C.—The paper dealt with a system of survey carried out by Colonel Tanner during the past four years in the Punjab Himalayas, with suggestions as to its adaptability for isolated surveys of unexplored countries.

Saturday, August 22nd.

Suggestions for the Revision and Improvement of the Large Scale Maps of the Ordnance Survey. By HENRY T. CROOK, C.E.—Reforms having been promised in the Ordnance Survey productions, it is desirable, the author said, to consider whether the large scale plans and maps answer the requirements of those who chiefly use them, namely, engineers, geologists, and other scientific men, and those engaged in the administration of imperial and local affairs. The purposes which the Cadastral Survey has to subserve are constantly increasing with the advance of scientific knowledge. It is admitted that the production of this class of maps is a proper function of Government. The efficiency of the organisation and the accuracy of the work done by the survey department is not disputed; but there is room for much improvement in the style of maps published, and in the amount of information conveyed. No adequate provision has been made for the revision of the survey, and in consequence a very large portion of the maps is obsolete. The author made suggestions for clearing off the arrears of revision work, and for maintaining the survey maps reasonably up to date he proposed that the country should be divided into districts under superintendents, each district office being charged with the revision of the maps of its district within a limited period. He suggested that the services of these district offices might be at the disposal of any one requiring plans or maps with manuscript corrections up to date on payment of suitable fees. He thought by these means the cost of maintaining the survey would be materially reduced. Then

followed some suggestions for improving the six-inch county maps, and the author concluded by urging that the scale of prices should be revised, and that better indexes should be provided for the different maps.

Monday, August 24th.

Antarctic Exploration. By E. DELMAR MORGAN.—Mr. Delmar Morgan showed that half a century had passed since the expedition under Sir James Ross entered the limits of the south polar region. The lands discovered by Ross and others were still delineated vaguely on our maps. It was, therefore, desirable that further antarctic explorations should be undertaken, and although the subject had been as lately before them as 1886, when the Government was urged to send out an expedition, no result had followed. The interest excited at that time in the cause appeared likely to die out. England looked on with indifference, and left the work to be resumed independently of her. In this indifference and opposition to antarctic exploration he believed that the difficulties had been unduly exaggerated, and the probable results under-estimated. The risks to be incurred were not greater but less than those to be met with in expeditions to the opposite pole. He compared the disasters, sufferings, and loss of life attending arctic with those of antarctic expeditions, showing that only five of the latter had attempted to enter high southern latitudes, and not a ship had been lost or a life sacrificed, while the results achieved for science were of the utmost importance. At the present moment a Swedish expedition was being fitted out under Dr. Nansen, and an American expedition under Mr. Percy, of the United States Navy. Ross twice crossed the parallel of 78° south. To those five expeditions, and to the whalers who annually visited those seas, they were indebted for all the knowledge they possessed of the antarctic regions. Ross and D'Urville were the only navigators to land, and Ross would have wintered there if he could have found a harbour for his ships. The first object of the next expedition must be to find such a harbour, and, having established their wintering station, probably on Victoria Land, within sight of Mount Erebus, to take advantage of the clearer atmosphere prevailing during the winter months for carrying out those observations which would be rendered impossible during the summer owing to atmospheric causes. Such an advanced party of explorers would not be cut off from all communication with their fellow men, for the antarctic region, unlike the arctic, was surrounded by a belt of ocean 2000 miles wide, navigable throughout the year, by means of which news and supplies could be conveyed from the nearest ports of Australia, Tasmania, and New Zealand. Should it be said that England declined to aid in a work which would form a fitting close to the 19th century of discovery and exploration by opening the last remaining gateway to the unknown?

Photography applied to Exploration. By J. THOMSON.—This paper will be published in full in the 'Proceedings R.G.S.'

Journeys in the Lake Ngami Region. By HARRY D. BUCKLE.—The author pointed out that the country around Lake Ngami had been very little described. Taking it altogether, it was an exceedingly dreary country. After indicating its leading physical characteristics, he dwelt on the extraordinary growth of reeds around the lake. For upwards of 30 miles on the south-eastern side it was impossible for the traveller to see the water owing to the density of the reeds. It was remarkable that the natives of this region were always anxious to imitate Europeans in every way. When clothes could be obtained the natives always dressed in the European fashion. On the whole, the country would repay study from the geographical point of view; it could be developed commercially so as to be made profitable by

the raising of cattle, while it was also believed to contain large quantities of gold, silver, and lead.

A Visit to Kilima-njaro and Lake Chala. By Mrs. FRENCH-SHELDON.—Mrs. Sheldon gave some details as to the circumstances of her journey and her intercourse with the natives. The results of her visit to Lake Chala have already been published in the 'Proceedings.'

The Geography of South-West Africa. By Dr. HENRY SCHLICHTER.—South-west Africa is in many respects only imperfectly known to geographers. Our information about Great Namaqualand, the western Kalahari, the large Kaoko district, and the Belt between the Atlantic Ocean and the highlands of the interior is by no means satisfactory. Since Germany has acquired territories in South-west Africa many scientific and other travellers have traversed the German sphere of influence, and thereby contributed to our knowledge of the country. But geographical science has not yet gained much by these recent German explorations, for, with the exception of a few books and scientific publications, all the information has reached the public and been preserved only in various German papers and periodicals, mixed with many more or less unimportant colonial matters. The author has therefore tried to collect the geographically important facts from these sources. Moreover, the old explorations of South-west Africa needed a revision. Mr. Theal, who has searched the archives of the Cape Colony, has recently discovered that the Orange River was known before Gordon reached it in 1777, and that in 1761-62 a well-equipped expedition penetrated into the interior of Namaqualand, much further north than Paterson, Gordon, and other travellers did. In 1791-92 a second exploring party reached a point still further north. But these interesting journeys were soon afterwards forgotten. The author has found that the British Museum contains the full diary (printed in Amsterdam, 1778) of the first of these expeditions, and as Mr. Theal has given only short reports, without going into geographical details, the author has examined this diary and compared it with the literature of the present and the last century. He finds that this old expedition is of considerable importance for our knowledge of South-west Africa. The object of the author in this paper, therefore, is to collect and criticise the new and old reports unknown to geographers, and to give a correct account of the present state of the geography of South-west Africa.

Tuesday, August 25th.

The Siam Border. By LORD LAMINGTON.

Colorado. By Dr. BELL.—This paper gave information as to the agriculture, the land laws, the coal fields, and the precious metals of the State.

The Physical and Industrial Geography of Florida. By A. J. MONTEFIORE.

The Volta River. By M. G. DOBSON.—This was an account of a visit to the Volta river in 1876-77.

The Bakhtiari Country. By Mrs. BISHOP.—The authoress said that a great deal remained to be investigated, and the country would be found of interest and profit to the geologist, biologist, the botanist, and the anthropologist. The map of the country showed an area of 15,000 square miles, in the 31° to 34° North latitude, and 48° to 51° East longitude. The distance she actually travelled was over 700 miles. A great many objections were made at Teheran to her joining the expedition, but those were overcome by Sir Drummond Wolff, and the Sultan issued instructions for the proper arrangements to be made for her comfort. She could not

agree that the people of the Bakhtiari country were savages. In the first place, they were clothed, and they had that further mark of true civilisation, that both sexes were clothed in Manchester cotton. They showed reverence for old age and respect for infancy, which was not found in other savage tribes. In the four months she spent amongst them no one offered any personal rudeness—she meant that no man of the Bakhtiari ever lifted the curtain of her tent. They were a pleasant people, and it was easy to move amongst them. The safety of the traveller in the Bakhtiari country depended upon his observance of Bakhtiari custom—not violating it where it was possible to avoid doing so. Her journey might be divided into two parts. Over the first portion of it two English officers had preceded them on a survey expedition, and wherever those officers had been the natives spoke well of the English, such had been the influence for good exercised by those officers. Her part of the expedition consisted of herself, an interpreter, a cook, and two muleteers. She (Mrs. Bishop) rode on horseback, and they were obliged to take four mules, owing to the necessity for carrying all provisions (except meat) for forty days. The party altogether numbered eighteen men, of whom two only were Europeans, with twenty mules and a few horses. With that party she travelled through that very wild country without any serious disaster. Travel was comparatively easy in the Bakhtiari country proper, but, on reaching beyond it, outside the range of the influence of the officers to whom she had referred, the people were suspicious, and the party were fired upon twice by a number of tribesmen, but no one was injured. She started for Ispahan on the 30th of April last year, and the first stage of the journey to Shanisaban was through a desert with 300 villages, each village an oasis, each oasis a paradise. On elevated plains, at an altitude of 6000 ft., they found remains of Armenian villages and Armenian graveyards, showing that, probably in centuries long past, Christianity was professed by a far larger number of people in the country than at present. On her journey she experienced the cleverness of Bakhtiari thieves and the celerity of Bakhtiari justice. In a village she was robbed of all her money, being left absolutely penniless, but in a few days she was repaid the full amount by the local *cadi*, who had levied it upon the village where the robbery took place. The thief was liable to have his right or left hand cut off, and the decision of which it should be was referred to her. After an interesting account of the agriculture of the country, Mrs. Bishop said her chief interest was in the Bakhtiari themselves, and a medical chest she took with her, together with minor surgical operations which she undertook, opened the way for her materially in her observance of the native character and customs. Though, as Moslems, the Bakhtiari despised women, yet women acted as their doctors. Blood feuds were marked features, in which revenge was taken either by killing the enemy, stealing his cattle, or boycotting him—"leaving him (in Mr. Parnell's phrase) severely alone." The Bakhtiaris professed great friendship for England, but she believed, if ever there came a collision between two armed Powers, who should be nameless, in south-west Persia, the Bakhtiari horsemen would be sold to the highest bidder. Polygamy was the custom of the country, and no female servants were allowed who were not also wives of the man of the house. A Bakhtiari man, therefore, married as many women as he could support, but the women were unveiled and had perfect freedom. However savage inter-tribal wars might be, the women were always safe. Mrs. Bishop devoted some space to the religious beliefs of the Bakhtiari, which included the idea of a Supreme Being and an Intercessor, heaven and hell, with a further probation beyond this life, which might terminate happily, and a final Judgment Day. Sin they defined as cowardice, breaches of the Seventh Commandment, and offences against the tribal interests and the chief. Virtue they held consisted of bravery, charity to the poor, chastity, and a readiness to take up the quarrels of the tribe and maintain its

interests. Women were not admitted to immortality. Their belief was peopled with genii or spirits of evil. They had some idea of the Unity of God, but of the Fatherhood of God, the brotherhood of man, that love to God and man is the fulfilling of the law, or of the light which He who is the Resurrection and the Life has shed upon the destiny of the human spirit they had no conception. Savage life was only enchanting viewed from a distance, and the life of the Bakhtiari was no exception to the rule. Still, she looked back upon her visit with pleasure, choosing to think rather of the virtues of the interesting people of that remote country.

Physical Aspects of the Himalayas, and Notes on the Inhabitants.
By Colonel TANNER.

NEW GEOGRAPHICAL PUBLICATIONS.

(By J. SCOTT KELTIE, *Librarian R.G.S.*)

EUROPE.

Hess, Heinrich.—Special-Führer durch das Gesäuse und durch die Ennsthaler Gebirge zwischen Admont und Eisenerz. Zweite . . . Aufl. Wien, Artaria & Co., 1890: 12mo., pp. xi. and 136, illustrations. [Presented by the Publishers.]

[Joanne's Guides.]—Collection des Guides-Joanne. Itinéraire Général de la France, par Paul Joanne. De la Loire à la Gironde, Poitou et Saintonge. Paris, Hachette & Co., 1891: 12mo., pp. xxvi. and 290, maps and plans.

[—] Do. Grèce. II. Grèce Continentale et Iles. Paris, Hachette & Co., 1891: 12mo., pp. xl. and 509, maps and plans.

Kuster, [Dr.] Emil.—Die deutschen Buntsandsteingebiete, ihre Oberflächen-gestaltung und anthropogeographischen Verhältnisse,—Forschungen zur deutschen Landes- und Volkskunde . . . herausgegeben von Dr. A. Kirchhoff. Fünfter Band, Heft 4. Stuttgart, J. Engelhorn, 1891: 8vo.

[Switzerland.]—Annuaire de la Suisse pittoresque et hygiénique. Stations de cures d'air, bains, belles excursions, villes d'hiver de la Méditerranée. Troisième édition, 1891. Paris, Firmin-Didot & Cie.: 12mo., pp. 532, maps and illustrations.

ASIA.

[Asia.]—A Catalogue of Maps, Plans, &c., of India and Burma and other parts of Asia. Published by order of Her Majesty's Secretary of State for India in Council. London, E. A. Arnold, &c., 1891: folio, pp. 154 and 7. [Presented by the Record Branch, India Office.]

AFRICA.

Johnston, H. H. [C. B., &c.]—Livingstone and the Exploration of Central Africa. London, G. Philip & Son, 1891: cr. 8vo., pp. xii. and 372. Price 4s. 6d. [Presented by the Publishers.]

This is the latest volume of the series entitled: "The World's Great Explorers and Explorations." Mr. Johnston, in treating of his subject, has endeavoured to be as unbiassed as possible, as the following extracts from his preface will show:—"This work is to be regarded more in the light of a sketch of Livingstone's life as an African explorer; it does not pretend to be a regular biography The author, however, has striven to write as accurately as possible, and above all to be impartial and unprejudiced in the treatment of his subject. With this end in view, he has caught eagerly at every legitimate opportunity for blaming, criticising, and even sneering at Dr. Livingstone's character and actions, in the dread lest his writing should become a mere

monotonous eulogy; and if these opportunities are so few that the general estimate of this book is that of nearly unmitigated praise, the conclusion to be drawn is, that Livingstone was a really great and good man, and that it is impossible to belittle him by recounting the truth, the whole truth, and nothing but the truth."

The volume contains a number of illustrations, including portraits, some of which are original, and seven maps as follows:—I. The range of the peoples speaking Bantu languages; II. Diagram showing the origin and degrees of relationship of the Negro, Hamitic, and Semitic races; III. Africa by Hylacomilus (1522), Africa by G. Gastaldo (1545); IV. Africa by Dapper (1671), Africa by W. D. Cooley (1852); V. Nyasa and the Shire Highlands; VI. Lake Bangweolo; VII. Livingstone's Travels in South Africa.

[**Silver, S. W.**—S. W. Silver & Co.'s Handbook to South Africa, including the Cape Colony, the Diamond Fields, Natal, British Bechuanaland, Bechuanaland Protectorate, Zambezia and its Gold Fields, the Transvaal and its Gold Fields, Orange Free State, &c. Fourth edition. London, S. W. Silver & Co., 1891: 12mo., pp. xviii. and 793. Price 7s. 6d.]

So many important political and other changes have taken place in South Africa since 1880—the date of the last edition of this work—that it has been found necessary that the present edition should not only incorporate wholly new territories which have come into political existence south of the Zambezi during the period, but that other portions of the book should be almost entirely rewritten. Thus the present edition may be said to be fairly brought up to date. The additional chapters deal with British Bechuanaland and the Protectorate, Zambezia, the German Possessions on the West Coast, Zululand, Swaziland, Tongaland, and Portuguese East Africa, besides a chapter on the South African Native Races. The gazetteer has been revised and enlarged, as also the map.

[**Slack, [Capt.] C.**—Introduction to Swahili. For the use of travellers, students, and others. London, Simpkin, Marshall, & Co., 1891: 12mo., pp. 16. Price 1s. 6d. [Presented by the Author.]

Consists of a short Swahili grammar and vocabulary. A map of Africa, showing the various European Possessions and Protectorates, is appended. Captain Slack has had the advantage of important suggestions from Archdeacon Farler.

[**South Africa**, from Arab Domination to British Rule. Edited by R. W. Murray, F.R.G.S. London, E. Stanford, 1891: 8vo., pp. viii. and 223. Price 12s. 6d. [Presented by the Publishers.]

An attempt has here been made, we are told, to produce a concise and trustworthy history of "South Africa from Arab domination to British rule." The work is really a series of fragments differing in value. It largely consists of extracts from De Barros, Dapper's 'Africa,' and other works, while the remainder has been contributed by various writers. The most important chapter is the first, by Prof. A. H. Keane, who tries to trace the history of the Portuguese in South Africa from the beginning of the 15th century downwards. Chapters III. and IV. deal with the colonisation of South Africa from the earliest period to the present time. In these chapters the editor endeavours to convey in some degree what English colonisation has done for Africa as compared with that of any other European power. Chapter V. treats of the occupation of Mashonaland, by J. W. Ellerton Fry. In Chapter VI. a description of the East Coast of Africa at Beira, Pungwe, and the Zambezi, is given by Neville H. Davis, with Notes on the Island of Chiloane, and an Appendix on British Zambezia. The maps illustrating the volume are as follows:—Pigafetta's Map of the Southern part of Africa, 1591; Dapper's 'Africa,' by Jacob van Meurs, Amsterdam, 1668; Map, showing the territory claimed by Portugal before the Agreement of 1890; Map of South Africa, showing the political divisions, 1891; and, Map of the route taken by the British South Africa Company's Pioneer Forces from Macloutsie River to Fort Salisbury.

Stuart, J. M.—The Ancient Gold Fields of Africa. From the Gold Coast to Mashonaland. London, Effingham Wilson & Co.: small 4to., pp. 312, maps and illustrations. Price 7s. 6d. [Presented by the Author.]

Mainly consists of a collection of extracts from various newspapers, books, &c., dealing with the subject.

AUSTRALASIA.

Pitcairn, W. D.—Two Years among the Savages of New Guinea. With Introductory Notes on North Queensland. With a Map. London, Ward and Downey, 1891: sm. 8vo., pp. xii. and 286. Price 5s. [Presented by the Author.]

An account of a visit to South-eastern New Guinea and the Bismarck Archipelago. Some useful notes on the customs of the natives are given, but the volume on the whole adds little to our knowledge of the country.

Zöller, Hugo.—Deutsch-Neuguinea und meine Ersteigung des Finisterre Gebirges. Mit Illustrationen und 4 Karten. Stuttgart, Berlin, Leipzig, Union Deutsche Verlagsgesellschaft, 1891: 8vo., pp. xxxii. and 546.

The author who is known to geographers by his journeys in West Africa and South America, attempted in this short expedition (October 1888) to penetrate into the unknown interior of North-eastern New Guinea. He started from Astrolabe Bay, accompanied by three Europeans and a number of native porters, marched through the wilderness near the coast, but was soon compelled to follow the course of the Cabenow river first south and then east as the only way to traverse these almost impassable regions. Suddenly the coast mountains terminated and an open district followed, contrasting very strikingly with the steep and rocky mountains around. Then commenced the high range of the Finisterre Mountains, and the country now rose from 1300 to 3300 feet above sea-level. Under the greatest difficulties the travellers pushed forward and reached at last a point of 5000 feet altitude, where a waterfall of the Cabenow river and steep rocks on all sides made a further advance of the whole expedition impossible. Therefore they encamped, and Dr. Zöller and the other Europeans, accompanied only by three natives, made a successful attempt to ascend the mountains in the neighbourhood. After two days of very difficult and dangerous climbing they reached a point of 8700 feet altitude, only about 1000 feet less than Mount Gladstone which was immediately east of it. Here a magnificent view suddenly opened up to the travellers, disclosing high and hitherto unknown mountains. Far away in the interior stretched an enormous chain of mountains to the west and south-west, belonging to the Bismarck Range, the highest summit of which (named by them Mount Otto) seemed to be snow-capped, and Dr. Zöller is of opinion that this is probably the highest mountain in the island. To the south another great range was visible, which they called Krätke Mountains, rising to a height of about 10,000 or 12,000 feet. Fearing to run short of provisions, they returned to the camp and subsequently to the coast, first by their original route and then by a more westerly direction.

The chief geographical results of this expedition are the discovery of the just mentioned high mountains south and west of the Finisterre Range, and the fact that the latter does not extend to the coast near Astrolabe Bay, as was hitherto assumed, but that the coast mountains are completely separated from the Finisterre Mountains by the open district through which the expedition passed. That this is correct is further shown by the varying geological character of the two ranges, the coast mountains consisting of sandstone, limestone, and conglomerates, whilst the Finisterre Mountains are of volcanic origin. From this it follows that the country rises from Astrolabe Bay in four great terraces, of which the coast mountains form the first, the Finisterre Range the second, and the newly discovered mountains the third and fourth.

Regarding the important question, whether the interior of the island is inhabited or not, the author is of opinion that native tribes are to be met with in all parts of the interior, though, as a rule, not in large numbers.

The volume then speaks of a German official expedition to the Solomon Islands, by which it was conclusively proved that a narrow passage exists between the islands of Buka and Bougainville (compare the 'Proceedings,' 1890, map, p. 444). The book further contains some ethnographical and linguistic information, vocabularies of a number of Papuan languages being of special interest.

Observations are added about the prospects and progress of German colonisation on the different islands, and it appears that with an outlay of comparatively little capital satisfactory results have been obtained.

The map showing the route of Dr. Zöller's expedition is well drawn, the course of the Cabenow river, as well as the numerous altitudes given, forming further additions to our knowledge of New Guinea.—[H. S.]

GENERAL.

[Geodetic Institute.]—Veröffentlichung des Königl. Preussischen Geodätischen Institutes. Das Berliner Basisnetz 1885–1887. Berlin, P. Stankiewicz, 1891: 4to., pp. iv. and 87, plates. [Presented by the Director of the Institute.]

Greely, A. W.—Geography of the Air.—The National Geographic Magazine, vol. iii. pp. 41–52. May 1, 1891. Washington, 8vo.

[International Geodetic Association.]—Verhandlungen der vom 15. bis 21. September 1890 zu Freiburg i/B. abgehaltenen Conferenz der Permanenten Commission der Internationalen Erdmessung redigirt vom ständigen Secretär A. Hirsch. Zugleich mit den Berichten über die Fortschritte der Erdmessung in der einzelnen Ländern während des letzten Jahres.—Comptes-Rendus des séances de la Commission Permanente de l'Association Géodésique Internationale réunie à Fribourg i/B. du 15 au 21 septembre 1890 rédigés par le Secrétaire perpétuel A. Hirsch. Suivis des Rapports sur les travaux géodésiques accomplis dans les différents pays pendant la dernière année. Berlin, G. Reimer, 1891: 4to., pp. 194, maps and plates. [Presented by the Director of the Association.]

[Odoric.]—Les Voyages en Asie au XIV^e siècle du bienheureux Frère Odoric de Pordenone Religieux de Saint-François, publiés avec une Introduction et des Notes par Henri Cordier. Paris, E. Leroux, 1891: large 8vo., pp. xiv., clviii., and 602. Price 48s.

This forms Vol. X. of the series entitled:—"Recueil de Voyages et de Documents pour servir à l'Histoire de la Géographie depuis le XIII^e jusqu'à la fin du XVI^e siècle," published under the direction of MM. Ch. Schefer and Henri Cordier. It is dedicated to the memory of the late Colonel Sir Henry Yule. In the introduction, the editor discusses the various editions of Odoric, and gives a short sketch of his life, &c., followed by a bibliography. Great care has apparently been bestowed upon the text and illustrations, and the notes will be of special service to students. A map illustrating the subject is also given.

Ogden, Herbert G.—Geography of the Land.—The National Geographic Magazine, vol. iii. pp. 31–40. April 30, 1891. Washington, 8vo.

Thoulet, [Prof.] M. J.—Océanographie (Statique). Paris, L. Baudoin et Cie., 1890: 8vo., pp. x. and 492. [Presented by the Author.]

This excellent work consists mainly of articles originally published by the author in the 'Revue Maritime et Coloniale,' and is the result of his researches both in the laboratory and at sea, and of his investigations on a mission from the Ministry of Public Instruction to Norway, Scotland, and Switzerland, to report on the work done in those countries on the fresh-water lakes. The author also gave a course of lectures on the science of the seas to naval officers at the observatory of Montsouris, and these are incorporated in this work. As the title indicates it comprises only the statics of oceanography, and a future volume is promised on the dynamics or kinetics of the sea. The first portion of the book is occupied by a historical introduction and a *résumé géologique*, in which the principal facts and theories of dynamical geology are recited. The oceanographical part proper is divided into five heads—namely, the topography

of the sea, submarine mineralogy and geology, the chemistry of the sea, the physics of the sea and ice. Under the first of these heads we have a pretty full description of the various forms of sinkers and sounding tubes in use, and the apparatus for the use of wire in sounding, a description of the distribution of ocean basins, and tables of their various dimensions. A short chapter is here included on the topography of lakes. This branch of the subject is not treated very exhaustively. The second head—Submarine Mineralogy and Geology—has to do with the deposits found at the bottom of the sea, which are partly organic and partly inorganic. The author goes pretty fully into the methods of detecting and estimating the various elements, furnishing both a chemical and a mineralogical analysis of a deposit. The distribution of the various types of deposits is then treated of. Under the head Chemistry of the Sea we have a description of the various forms of apparatus for collecting samples of water from different depths, and then we have a *résumé* of the analytical methods used for determining the constituents of sea water. A considerable space is also devoted to the chemical history of oceanic deposits. Under the head Physics of the Sea, a variety of important subjects are treated. The various forms of deep sea thermometers are described, and the distribution of temperature in the ocean is treated at considerable length. The density and dilatability of sea water, both under change of temperature and change of pressure, are treated along with the distribution of density. A short chapter on the biology of the sea and one on ice conclude the book. The author has on the whole done his work very well, and the book will be of great use to students of oceanography.—[J. Y. B.]

The following works have also been added to the Library :—

- [Azores].—History of the Azores or Western Islands; containing an Account of the Government, Laws, and Religion, the Manners, Ceremonies, and Character of the Inhabitants, and demonstrating the importance of these valuable Islands to the British Empire. London, Printed for Sherwood, Neely, and Jones, 1813: 4to., pp. viii., v., and 310. Maps and illustrations.
- Benyowsky, M. A. Count de.—Memoirs and Travels of Mauritius Augustus, Count de Benyowsky, Magnate of the Kingdoms of Hungary and Poland, one of the Chiefs of the Confederation of Poland, &c., &c. Written by himself. Translated from the Original Manuscript. 2 vols. London, Printed for G. G. J. and J. Robinson, 1790: 4to., pp. (vol. i.) 12, xxxiii. and 422; (vol. ii.) 399. Maps, plans, and illustrations.
- Boid, [Captain].—A description of the Azores, or Western Islands. From personal observation. London, E. Churton, 1835: 8vo., pp. viii. and 373. Map and illustrations.
- Labat, [Jean-Baptiste].—Nouvelle Relation de l'Afrique Occidentale: contenant une description exacte du Senegal et des Pais situés entre le Cap-Blanc et la Riviere de Serrelionne, jusqu'à plus de 300 lieues en avant dans les Terres. L'Histoire naturelle de ces Pais, les différentes Nations qui y sont répandues, leurs Religions et leurs mœurs. Avec l'état ancien et présent des compagnies qui y font le commerce. 5 vols. Paris, G. Cavelier, 1728: 12mo., pp. (vol. i.) xvii. and 346; (vol. ii.) xiv. and 376; (vol. iii.) ii. and 387; (vol. iv.) 392; (vol. v.) 404; maps and illustrations.
- [—].—Relation Historique de l'Ethiopie occidentale: contenant la Description des Royaumes de Congo, Angolle, and Matamba, &c., &c. 5 vols., Paris, Charles-Jean-Baptiste Delespine le Fils, 1732: 12mo., pp. (vol. i.) 495; (vol. ii.) 457; (vol. iii.) 462; (vol. iv.) 506; (vol. v.) 408; maps and illustrations.
- Sutherland, [Lieut.-Col.].—Original matter contained in Lieut.-Colonel Sutherland's Memoir on the Kaffers, Hottentots, and Bosjemans, of South Africa, Heads 1st and 2nd. Commentaries and Notes on the text used in the compilation of the Memoirs. Cape Town, Pike and Philip, 1847: 8vo., pp. iv. and 580.

NEW MAPS.

(By J. COLES, *Map Curator R.G.S.*)

ASTRONOMICAL.

Orrery.—Philips' Patent Revolving —, for finding the position of the various Planets for every Hour in the Year. Invented and patented by J. G. Parvin. G. Philip & Son, London and Liverpool. Price 4s. 6d.

This is a somewhat ingenious contrivance for finding the place in the heavens of the sun, moon, or planets. In general appearance it much resembles an ordinary planisphere; it has, however, two arms in front, graduated on their upper surfaces in degrees of declination. The only constellations given are those of the Zodiac; which seems a pity, as if the whole of the northern constellations had been given, it could have been used for other purposes. Full instructions for the manner in which it is to be used are printed on the back of the card.

EUROPE.

Artaria & Co.—Touristenkarten der Österr. Alpen, gezeichnet von R. Maschek sen. Bearbeitet und mit Distanzen versehen von Julius Meurer. Scale 1:130,000 or 1·8 geographical miles to an inch. Blatt VI. Nördl. Oetzthaler- und Stubai-Alpen, Nordwest. Kalkalpen (Lermoos, Zirl, Vent, Retschen—Scheideck, Arlberg-Pass, Landeck). Blatt VII. Zillerthaler Alpen, westl. Hohe Tauern, Rieserferner Gruppe, Achen See (Wörgl, Neukirchen im Pinzgau, Bruneck, Brenner-Pass, Innsbruck). Blatt VIII. Die Hohen Tauern, vom Ankogel bis zum Venediger (Saal/elden, Zell am See, Mittersill, Gastein, Lienz, Prigraten). Blatt IX. Südl. Oetzthaler- und Ortler-Alpen, Presanella Gruppe (St. Valentin a. d. Heide, Meran, Bozen, Campiglio, Bormio). Blatt X. Dolomit-Alpen (Bruneck, Cortina d'Ampezzo, Auronzo, S. Martino di Castrozza, Bozen). Blatt XI. Garda See, Adamello Gruppe (Pinzolo, Trient, Schio, Garda, Idrio, Arco, Riva). Artaria & Co., Wien. Price (mounted on linen and folded for pocket) 2s. 8d. each. (*Dulau.*)

These maps of the Austrian Alps have been specially prepared for the use of tourists, and contain a large amount of information that will be useful to pedestrians and others. For instance, the positions of the Alpine Club huts, shelters, huts where travellers can, during the summer, get food and lodging, as well as first and second class tourist stations, are all indicated by symbols. The routes are shown in red, the directions being pointed out by arrows. The distances, which are given in hours, apply to cases where an ascent is being made; in the case of a descent the time is to be reduced by one-third, but where the arrows are shown, the time required in both directions is the same. There is no note explaining the basis on which the calculation of time is made, but, from measurement, it appears to have been arrived at on the supposition that a tourist would travel at an average rate of about three kilometers an hour. From their portable size, and the large amount of information they contain, this series of maps will no doubt be of great service to tourists visiting the Austrian Alps.

— Special-Touristenkarte der Niederösterr.-steirischen Grenzgebirge. Nr. 1^a. Das Gesäuse mit den Ennsthaler Gebirgen. Scale 1:50,000 or 1·4 inches to a geographical mile. Für Touristen bearbeitet von Gustav Freytag. Verlag und Eigenthum von Artaria & Co., Wien, 1890. 4. Auflage. Price 2s. 4d. (*Dulau.*)

— Artaria's Special Touristen-Karte Nr. 4. Dachstein-Gruppe mit Distanz-Übersichtskarte. Scale 1:50,000 or 1·4 inches to a geographical mile. Für

Touristen bearbeitet von Gustav Freytag. Mit Beiträgen von H. Hess. Verlag und Eigenthum von Artaria & Co., Wien, 1891. Price 2s. 4d. (*Dulau*.)

These two maps have been produced by lithographic printing on linen-backed paper. The style of drawing is so different that they afford ample means for testing the experiment. In the map of the Dachstein Group, the hill shading is brown, the glaciers and water blue, roads and tracks red, and the valleys green; while in the Gesäuse map the hill shading is black, the roads and valleys being coloured red and green respectively. In both the elevations are shown by contours 100 metres apart. As this experiment appears to have been so successful, there seems every probability that in the future, all the tourist maps published by Artaria & Co. will be produced by a similar process.

Central Europe.—Touring Map of —, by J. G. Bartholomew, F.R.G.S. Scale 1:2,000,000 or 27 geographical miles to an inch. John Bartholomew & Co. The Geographical Institute, Edinburgh. Price 2s.; mounted on cloth, 3s.

This is one of 'Bartholomew's World Series' of travelling maps. It is nicely drawn, and shows all the railways of Central Europe. For the convenience of reference, the through routes are coloured red, and inset plans of Paris, Berlin, Vienna, and Rome are given, and steamboat routes between England and the Continent, with their distances in miles, are shown.

Deutschen Reichs.—Karte des —, im Massstabe von 1:500,000 or 6·8 geographical miles to an inch. Unter Redaktion von Dr. C. Vogel ausgeführt in Justus Perthes Geographischer Anstalt in Gotha. 27 Blätter (und Titelblatt) in Kupferstich. Erscheint in 14 Lieferungen (jede mit 2 Blättern) à 3 Mark. Lieferung I. Sektion 5, Königsberg. Sektion 25, Mülhausen i/Elsass. Justus Perthes, Gotha, 1891. Price 2s. 8d. each part. (*Dulau*.)

This is the first issue of a general map of the German Empire, which is to be completed in twenty-seven sheets under the direction of Dr. C. Vogel. It is intended to supply a want that has been felt for a map of the German Empire which shall hold an intermediate position between the small maps in atlases, and the larger Government surveys. The two sheets which constitute the present issue are those of districts as far apart as possible; the one, Königsberg, being at the extreme north-east, and the other, Mülhausen, at the extreme south-west limits of the map. They are both beautiful specimens of cartography, and it would indeed be surprising if this firm, which has published some of the best maps of other parts of the world, should fail to produce an equally good one of their own country.

The parts will be issued at intervals of from six to eight weeks, and the last part will be accompanied by a title sheet and an alphabetical index.

Italy.—Carta delle Strade Ferrate Italiane al 1° Aprile 1891; pubblicata per cura del R. Ispettorato Generale delle Strade Ferrate dall'Istituto Cartografico Italiano, Roma. Scale 1:1,500,000 or 20·4 geographical miles to an inch. Roma, Istituto Cartografico Italiano. Price 2s. 6d. (*Dulau*.)

Malta and Gozo.—Geological Map of —. By J. G. Bartholomew, F.R.G.S. Scale 1:129,254 or 1·8 geographical miles to an inch. Reduced from the Ordnance and Admiralty Surveys. With Geological Data from Surveys, by the Right Hon. Earl Ducie, Captain T. A. B. Spratt, R.N., Dr. Leith Adams, and Dr. John Murray. Scottish Geographical Magazine, 1891.

Scotland.—Bartholomew's Reduced Ordnance Survey of —. Scale 1:126,728 or 1·736 geographical miles to an inch. New Series. Sheets 7, Glasgow and Clyde District. 11, Oban and Loch Awe District. 12, Central Perthshire. John Bartholomew & Co., Edinburgh. Price 1s. each.

As their title states, these three maps are reductions from the Ordnance Survey. They are orographically coloured, and contoured to show the elevations above sea-level. The whole series of these maps, as regards Scotland, is No. X.—Oct. 1891.]

now complete, with the exception of Sutherlandshire, and can be purchased in separate sheets. They are specially suited to the wants of ordinary tourists and pedestrians; they are very nicely drawn, have been compiled with great care and accuracy, and will compare very favourably with any map published at the same price in this country.

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AFRICA.

Deutsch-Ostafrika.—Kettler's Schul-Wandkarte von —. Scale 1:2,000,000 or 27 geographical miles to an inch. Weimar, Geographisches Institut. 2 sheets. (*Dulau.*)

This map is well suited to the purpose for which it is published. It shows accurately the political boundaries; the physical features are indicated by orographical colouring. It is drawn in a bold style, and contains an inset map of Central Germany, on the same scale as the principal map.

South Africa.—Juta's Map of —, from the Cape to the Zambezi. Compiled from the best available Colonial and Imperial information, including the official Cape Colony Map by the Surveyor-General, Cape Town, Dr. T. Hahn's Damara-land, and F. C. Selous' Journals and Sketches, &c. Scale 1:2,536,750 or 34·74 geographical miles to an inch. New Edition. Published by J. C. Juta & Co., Cape Town, and E. Stanford, London, 1891. 2 sheets. Price, in sheets, 1*l.* 1*s.*

Previous editions of this map have been favourably noticed in the 'Proceedings.' In the present instance it has been carefully corrected, shows all the latest boundaries, and exhibits the present status, as regards the spheres of influence of European powers south of the Zambezi. It is clearly drawn, and is on a sufficiently large scale to admit of considerable detail.

AMERICA.

Mississippi River.—Detailed Hydrographic Chart of the Ultimate Source of the —. Drawn by J. V. Brower, a Commissioner in charge of an expeditionary examination conducted under the authority of the Minnesota State Historical Society, during the year 1889 and thereafter, and also Commissioner of the Itasca State Park, 1891. Scale 1:21,120 or 3·4 inches to a geographical mile. Pioneer Press, St. Paul, Minn.

The Fellows of the Society will no doubt remember that Capt. Glazier, in a note which appeared in the Royal Geographical Society's 'Proceedings,' January 1885, advanced a claim to being the discoverer of the true sources of the Mississippi River, his note being accompanied by a map to illustrate his claims. The Minnesota Historical Society, and other citizens of that State, doubting the accuracy of Capt. Glazier's conclusion, applied to Governor Merriam to have the Itasca basin thoroughly surveyed by a competent staff, and in keeping with this application, Governor Merriam appointed Mr. J. V. Brower to carry out the survey, the result of which is the map under consideration, and the report which is printed round its margin, from which it would seem that Capt. Glazier was premature in arriving at the conclusion that he was the real discoverer of the sources of the Mississippi, and that, as a fact, the map he prepared does not show the sources of that great river.

The question as to Capt. Glazier's claim was discussed at the International Congress at Berne, and a formal resolution was passed repudiating it and awarding the honour to H. R. Schoolcraft, Lieut. Allen, and J. N. Nicollet (1832-1836).

A comparison of Mr. J. V. Brower's map, which is the result of careful and actual survey, with that of Capt. Glazier, shows that the latter contains many serious errors. The conclusion arrived at by Mr. Brower is, that the first surface flowage in the greater ultimate reservoir of the Mississippi, is a tiny brook connecting Whipple Lake with Floating Moss Lake. The report which accompanies the map contains many interesting details, and has been so carefully prepared as to leave no doubt as to the accuracy of the conclusions arrived at.

ATLASES.

Indian Ocean.—Cyclone Tracks in the —. From information compiled by Dr. Meldrum, C.M.G., F.R.S. Published under the authority of the Meteorological Council. London: Printed for Her Majesty's Stationery Office, by Eyre and Spottiswoode. 1891. Price 7s.

The charts contained in this atlas have been compiled from information supplied by Dr. Meldrum, Government Meteorological Observer, Mauritius, who for many years has made a study of this subject. In the preface, Mr. Scott calls attention to the fact that in dealing with cyclones, Dr. Meldrum has divided them into progressive and stationary, which, if duly established, would be one of considerable importance to seamen, and one that would greatly influence their action in the neighbourhood of a cyclone. It seems, however, that at present the information collected is not sufficient to fix, with any degree of certainty, the seasons of occurrence of cyclones of those two different classes, and as yet it appears that the ratio between the progressive and stationary cyclones is different at different seasons, and the doubt whether full information of every storm has been obtained, must prevent the proportions, as given in the atlas, being accepted as absolutely correct.

The maps give the tracks of cyclones from 1848 to 1885 inclusive, except for the years 1849, 1850, 1853, when no reports of cyclones were received by Dr. Meldrum. These are followed by monthly charts extending over the same period, on which, tracks of all the cyclones which have taken place in each month are laid down, those of different periods being distinguished by the manner in which the track is drawn. The collecting of the data, and the compilation of this atlas, must have entailed a vast amount of work, which however, its importance to seamen fully justifies.

Stieler's Hand-Atlas.—Namensverzeichnis zu —, in 95 Karten, enthaltend 200,000 alphabetisch geordnete, im Atlas vorkommende Namen mit Hinweis, wo dieselben auf den Karten zu finden sind. Price 5s. 10d. (*Dulau*.)

The present issue is the index of this excellent atlas, consisting of 197 folio pages, in which the positions on the maps of 200,000 places are given. It is alphabetically arranged, and explanations of the manner in which it is used, as well as of the abbreviations which appear, are given on the first page.

Universal Atlas.—The —, complete in 28 parts, including Index. London, published by Cassell & Co., Limited, for the Atlas Publishing Company, Limited. Part 6. Price 1s. each part.

Sheet 4 contains physically coloured hemispheres, land and water hemispheres, and a small map on Mercator's projection coloured to show the continents. On the physical hemispheres there are numbers which indicate the positions of mountains, the elevations of which are given opposite a corresponding number in a footnote. Sheets 97 and 98 contain maps of the West India Islands and Central America.

PHOTOGRAPHS.

West Indies and Venezuela.—36 Photographs of —, taken by F. J. W. Isaacson, Esq., in the spring of 1891, and presented by him to the Royal Geographical Society.

This is an interesting set of photographs of characteristic scenes in the West India Islands, and Venezuela.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.



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PROCEEDINGS
OF THE
ROYAL GEOGRAPHICAL SOCIETY
AND MONTHLY RECORD OF GEOGRAPHY.

*Journey across the Western portion of the Great Persian Desert, via the
Siah Kuh Mountains and the Darya-i-Namak.*

By C. E. BIDDULPH, Assistant Commissioner, Berars, India.

CAPTAIN VAUGHAN and myself left Teheran on April 7th, intending to march to Ispahan via the Siah Kuh, with the object of ascertaining the routes crossing these mountains towards the south, and more particularly inquiring into the nature and defining the limits of the extent of ground marked on most maps as a swamp, into which the several rivers crossed on the road between Teheran and Kum were supposed to empty themselves.

We found all the maps to which we had access to be quite incorrect, both as regards the position and the nature of the area thus marked as swamp, for as to the position assigned to it, this we found to be actually rather high ground with villages scattered over it at intervals. The swamp itself, instead of lying to the north and north-west of the Siah Kuh, is situated to the south and south-west of this range, and divided into two portions perfectly distinct from one another, and separated by many miles of dry land. Of these the larger is known by the name of the Darya-i-Namak, or Sea of Salt, and extends over a vast area; it lies immediately to the south of the Siah Kuh mountains, and stretches as far as the eye can reach on either side. The smaller swamp is really a lake of comparatively trifling dimensions, and of quite recent formation, it is only swampy on its eastern margin; on its western margin, where the road between Teheran and Kum passes close by it, its limits are plainly defined, owing to the rocky nature of the ground, and its waters are perfectly clear, without any sign of containing an excessive amount of salt in solution, either by incrustation along the edge or otherwise; in fact, the river to which it owes its origin is not in any way remarkable for the saltiness of its waters.

To understand the relative positions of the Darya-i-Namak and this new lake, a reference must be made to the map, where it will be seen that three rivers cross the line of route between Teheran and Kum, and



are lost in the desert, extending thence towards the east; these are (1) the Kum river, (2) the Kara Chai—these unite lower down in their course, and form, I believe, the New Lake; (3) the Shur Rud; (4) another river near Hasanabad—the name of which I forget—it is of a good size. Both these latter flow, as far as I could make out, into the Darya-i-Namak, the latter, after watering a considerable area of country towards the south of the site marked on the map as that of the ruins of Veramin.

The views obtained from the summits of the Siah Kuh and from the high ground on the road between Kum and Teheran are sufficient to show that the Darya-i-Namak is separated by a considerable interval of dry land from the New Lake. The Darya-i-Namak appears from the top of the Siah Kuh to be a salt swamp, extending over a very large area of country, and covered for a great portion of its surface with a thick incrustation of salt, which it must have taken many centuries to form.

While on this subject, it may be as well to make some remarks upon the general character of the great Persian desert, and the difference between those portions termed "Kavir" and the deposits of salt of which the "Darya-i-Namak" is a specimen, as far as I could gather from my own limited experience, and from inquiries made from inhabitants of the country. It will be remarked that upon maps this area is usually described as the Great Salt Desert; this is not an accurate description of the general nature of the surface there presented, for a great portion of this is covered with soil, showing no sign of the presence of any salt in its composition, and which, but for the utter absence of water, would probably be more or less covered with vegetation. Even as it is, at certain times of the year, particularly after the melting of the snow upon the higher ground, it bears a sprinkling of grass and various herbs, which afford a sufficient grazing for the flocks of the wandering tribes which haunt these parts.

The saline efflorescence, known locally by the term "kavir," appears only in portions of this desert, and then not necessarily upon low ground, for its appearance is not owing to any deposit of salt left upon the surface of the ground by the evaporation of water containing salt in solution which has covered it, but rather to the presence of salt in the composition of the soil, which, owing to the action of dew or some slight rainfall, has worked itself up from below and become deposited upon the surface. This efflorescence is of common occurrence in Sind, Beluchistan, and the Punjab, where it is found in places covering the ground for many miles, and that at long distances from any water, and where the rainfall is so slight as to average hardly more than about eight inches a year; the thickness of this efflorescence seldom exceeds that of a stout piece of paper, and resembles most the ice formed by a slight frost upon shallow streams, called popularly "cat's-ice." The Darya-i-Namak, on the contrary, which is the only saline deposit of its nature that has come within my experience, constitutes an extensive tract of hollow

ground covered with an incrustation of solid salt several feet in thickness in most places, and in some parts it might be said of almost unknown depth, which it must have taken many centuries to form.

To go on with the narrative of our journey. Following a south-east direction we camped on April 8th at a village called Mirza Jafir, at the foot of the outlying spurs of the Elburz range and almost due south of the peak of Demavend, which served as a landmark throughout our march till we got within view of the Natanz peak towards the south. This village is the last one of any pretensions towards the desert; it is distant about 35 miles from Teheran, and our way so far had lain through very fairly cultivated land; beyond this point, however, the landscape altered, and we began to enter upon the desert, there being only one or two villages farther on, and those of insignificant dimensions and separated by long stretches of desert.

Our road to Mirza Jafir passed through the ruins of the ancient Persian city of Veramin, which, to judge from the extent they covered, must have been a sufficiently important one in former days. Unfortunately, in consequence probably of the bigotry of the Mussulman invaders, the only building left in anything approaching to a state of preservation amidst these, is a single tower of a very peculiar form, covered with inscriptions, which loomed out in the distance in solitary grandeur amidst the ruins and decay by which it was surrounded. It had apparently constituted originally a fire-temple, and was in a wonderfully good state of preservation considering its great age, for the tiles bearing the designs and inscriptions were still mostly perfect; the base of the tower was, however, so undermined by the breaking away of the bricks forming it, that there seemed but little probability of its being able to stand the wear and tear of many years more. It seems a pity that such an interesting relic should be allowed to disappear, but any steps to prevent such a thing are, of course, quite out of the question in such a country as Persia, unless undertaken by private enterprise, which is most improbable.

On April 9th we arrived at the village of Kala Buland, distant about 40 miles from Teheran; here we were obliged to halt for three days, in order to obtain camels to carry supplies of grain and grass for our mules, and food for ourselves and our servants, for the period during which we should be traversing the desert, where no supplies are procurable of any description for man or beast, and water only at long intervals.

On April 12th we arrived at Karim Kaneh, a little oasis constituting a sort of outpost towards the desert, whose sole occupants were a single family. Our way thus far had lain through the area laid down, upon all the maps we could see, as a vaguely defined swamp, but which we found in reality to contain numerous villages separated by considerable intervals of desert.

On April 13th, our caravan, which consisted of sixteen mules, eight camels, three horses, ourselves, and nine servants, commenced our march across the desert in the direction of the Siah Kuh, about 45 miles distant. Had we chosen we could have done the distance direct, but we preferred to make two marches of it, both to prevent over-fatigue to ourselves and also for the sake of exploring the country, and we decided to halt for the night at the only intervening spring, at a spot called Gul Chashm, about 16 miles distant amongst some low hills.

Leaving Karim Kaneh we crossed, at a distance of a couple of miles, a small stream which appears to run a considerable distance to the east into the desert. To judge from its appearance, it must be the remains of some canal of considerable pretensions in former days, for it ran at the bottom of a deep and broad channel of apparently artificial construction; the volume of the water it contained was trifling, but we were told that it continued its course quite 20 miles further east. Unfortunately, we had no opportunity of verifying this fact.

Crossing this stream we traversed another eight or ten miles of plain before we entered the hills amidst which lay our camping ground for the night. These we found to constitute a regular labyrinth, amidst which we wandered for hours and hours searching for the spring which, when we found it, proved to be so limited in the supply it offered that our animals could only drink by detachments, each successive one waiting till the little hollow into which the water trickled, and which had been completely emptied by the preceeding one, had had time to fill itself again; not to say that the water itself when obtained was muddy and brackish, and hardly fit for human consumption under any circumstances.

Those who have never lived in any countries but such as abound in streams and springs, and where brackish water is unknown, can hardly understand what an important part the presence and quality of water plays in the existence of those who reside in regions such as Persia and Central Asia, and how much the comfort of these is affected by the merits of the particular supply of water upon which they are dependent for their daily sustenance. To an Englishman, for instance, it sounds strange to hear a discussion upon the merits of the water at some particular place as if it were some rare kind of wine, and to the last degree absurd to have his servants urging him, when he is already tired with a long march, to go on some miles further before halting, on the plea that the water there is so much better than at the place where he proposed to stop. When, however, one has had some days' experience of the vileness of the flavour and the unpleasantness of the effects which water, apparently bright and clear, to judge from its appearance, is capable of attributing to itself, and has tried to disguise the taste with tea or spirits, only to find that tea and Epsom salts are, if possible, still more nauseous than Epsom salts and whiskey, and that for a thirsty

man the only thing to do is to grin and bear it, and be thankful to be able occasionally to wet his mouth with the filthy solution of salts and minerals which is all that nature has thought fit to provide for the convenience of those who venture into many portions of these regions. To such as these it does not take long to understand the merits of a delicious draught of really sweet water, or that the first question which comes to the lips upon arriving at a well or spring is, "Is the water sweet?"

The hills amidst which the first part of our route lay after leaving Gul Chashm for our next halting place amongst the mountains of the Siah Kuh, consisted principally of that peculiar formation of marl so commonly seen in these parts, as in Afghanistan and Beluchistan, the brilliance of the blue and green colouring of which has led to such extravagant illusions on the part of the inexperienced, as to the mineral wealth they contained. There is no doubt that the colours thus presented are due to the presence of copper and other minerals, but in such infinitesimal quantities that in most cases one might just as well try to extract iron out of one's blood as attempt to find it in the red limestones and sandstones of these regions.

Emerging from these hills we marched for about 20 miles across a broad plain to the foot of the Siah Kuh; we then entered the defiles of this range and passed, some three or four miles to our left, the ruins of what must have been a very fine caravansarai, built by Shah Abbas the Great. We wound our way through the lower ranges for some five or six miles or so, till we arrived at the ruins of another equally fine caravansarai, mostly solidly constructed, which even now in its dilapidated condition was able to afford sufficient shelter to a large kaffila of mules, which we found encamped there on its way from Ispahan to Meshed. We did not halt here, as we found the water, though bright and clear in appearance, to be so salt to the taste as to be quite undrinkable; and we went on a couple of miles farther, to a well we were told of called Hauz Mahomed, where the water was sweeter. As a matter of fact, I believe that we should have taken another path which would have led us to a spring called the Chashm-i-Shahi, where the wandering Arabs whom I encountered told me that there was abundance of water, and the remains of a tank and aqueduct built by the inevitable Shah Abbas, but for some occult reason our muleteers, who were overpowered with alarm at one time lest they should lose their way and fail to find water, and at another lest they should encounter robbers, objected to following this path, although the more direct, and preferred to take us to Hauz Mahomed, which was nothing but a muddy spring, close by which was an encampment of Ilyats. We were so tired by the heat and the length of this march that we determined to halt a day, and the next morning I took my rifle and climbed up to the top of the mountain in hopes of bagging an ibex. This I did not succeed in doing, though I saw several; but I was amply rewarded for my disappointment

by the splendid view I obtained thence of all the surrounding country for a range of many miles.

The mountains of the Siah Kuh rise to a height of about 5000 feet above the level of the surrounding plains, which themselves constitute a plateau of about 3000 feet to 4000 feet above the sea-level. With the aid of a good field-glass I was thus able, owing to the clearness of the atmosphere, to see as far as, I dare say, 50 miles or more on either side. Looking towards the north I could distinctly trace the course of the masonry causeway built by Shah Abbas to facilitate the communication with the south across this part of the desert, but the most remarkable feature of the landscape was that presented by the Darya-i-Namak, the extent of which was fairly well distinguishable from this point of vantage, in spite of the glare which surrounded it.

For miles and miles away at our feet stretched what looked in the distance a vast frozen lake, but which was in fact a deposit of salt that entirely covered the low plains towards the south, and extended as far as the eye could reach towards the east and west, glittering in the sun like a sheet of glass. Towards the extreme west we imagined that this solid sheet was replaced by water, for we fancied we could see the ripples on its surface and the foam along the edge as the wind, which was high, drove it against the shore; but this may only have been owing to the heated air upon the surface, and the broken pieces of salt which were strewn along the margin. We sat for hours looking at this strange spectacle and examining it through our field-glasses, while our guides, who were some of the wild Ilyats, or wandering tribes which haunt this neighbourhood, entertained us with all manner of strange stories regarding the peculiarities of its composition and the dangers to be encountered in traversing this vast deposit of salt.

According to their accounts, it was of the consistency of ice, and, like the latter, formed a coat of varying degrees of thickness upon the top of the water or swampy ground which lay underneath it. In some places they declared that this layer of salt attained a thickness of several feet, and that with such a degree of density that laden camels and mules could cross over it with perfect safety; while in other places where this was not the case, the crust of coagulated salt would break under their weight did they attempt it, and they would be engulfed in the waters or morass below beyond all hope of extrication. There appeared to be but one path, across which only those who were in the habit of traversing it, such as the owners of camels and mules, were well acquainted with, and which no one else in consequence attempted without a competent guide, for there was but little to mark its course, and if once lost sight of, the unfortunate traveller might wander for hours or days without finding it again, and probably end by dying of thirst if he succeeded in avoiding the more dangerous parts incapable of bearing his weight, where he would inevitably be swallowed

up. They told us that the passage across this plain was quite impossible by day, at any rate if the sunshine were very bright, on account of the dazzling effect which its reflection upon the white surface of the salt produced, which was such as to quite prevent persons attempting it from seeing where they were going; and they recounted numerous instances of cases which had occurred of travellers who had disappeared from losing their way, and never been heard of again. Of course it seemed to us impossible to imagine how all this could be the case, for in a saturated solution of salt and water the salt would naturally be deposited upon the bottom, and not caked upon the surface; the guides, however, were so positive about the truth of what they said, and the appearance of the plain before our eyes seemed so peculiar, that our curiosity was thoroughly aroused, and we determined in consequence to completely change our intended route for the purpose of crossing the salt, especially as the moon being just at its full, every facility was offered for doing so. Our muleteers we found to make no objection, as they said that they were in the habit of crossing by this route, and that the surface of the salt was so hard and smooth, that it presented capital footing for the baggage animals. The following evening, accordingly, we found ourselves with our whole convoy of eight camels, sixteen mules, and three horses, approaching the margin of this salt plain, which was distant about 15 miles from the foot of the mountain. As we neared this margin, the ground, which had been hitherto hard and dry, became damp and sloppy, so that we had to confine ourselves to moving along a distinct tract, which had probably been used for centuries. To judge from the appearance of the ground here, a regular swamp must extend from the salt for some distance along its margin at certain seasons of the year, for on all sides were to be seen marks of animals who had strayed off the tract, and got stuck in the clayey mud, from which it would seem in many cases, from the skeletons lying about, that they had been unable to extricate themselves.

After following this tract, as it wound through this swampy ground for about a mile or so, we entered upon the sheet of salt itself, which, where the incrustation was thin, as was the case for some distance from its edge, was soft and sloppy, and mixed with earth resembling very much in its appearance the edge of the ice upon a frozen pool when a thaw has set in. As we proceeded it gained more and more in consistency, till, at a distance of three or four miles from the edge, it looked like nothing more than a surface of very solid ice, such as might have been seen on any pond in England during the course of last winter. For this indeed, so far as its appearance went, it might easily have been mistaken, had it not been that, though the whole area over which it extended was perfectly level, the surface itself was not quite even, but resembled more that of ice which had partially thawed and then frozen again after a slight fall of snow; and further, that instead of being

continuous, it was broken up into countless polygonal blocks, whose dimensions varied from about six inches across to two or three feet or more. Of the solidity of this incrustation there could be no doubt, for there we were, camels, horses, and mules, travelling over it without a vibration of any kind being perceptible, or any sign of our weight making an impression on it. After marching for about eight or ten miles upon this strange surface, we halted to examine, as far as we could by the moonlight, its composition. We tried, by means of a hammer and an iron tent-peg to break off a block of salt to take away with us as a specimen, but found it far too hard for us to make an impression upon it, and though we succeeded in bending our tent pegs almost double, we did not accomplish our wish; we managed, however, to chip off a lot of fragments, which we found here to be of the purest white; these were quite hard when we got them, but after keeping them a day or two they took up so much moisture from the air, that they got soft and friable and changed their colour to a slaty blue.

We were assured by the muleteers and others that at this distance from the edge the salt deposit was as thick as eight or ten feet, and it seemed possible from our failure in the attempt to bore into it that this might not be any great exaggeration on their part; they stated also, as I have mentioned, that under this crust lay, if not standing water, at any rate a quagmire, and that if we had succeeded in our intention of breaking through the salt, the water from beneath would have burst through the opening thus made and flooded all the surrounding space; they further told us that in the winter, when the snow fell and melted on this surface, there was always water standing upon it, and that later on, as the snows on the surrounding higher ground thawed at the approach of spring, this increased to a depth of two or three feet; but that the mules could always cross so long as it did not get too deep for them to find footing, for that the layer of salt itself never lost any of its solidity, in spite of the water lying on it.

It is difficult to explain this phenomenon except upon the theory that this incrustation is the deposit accumulated upon these low plains in the course of centuries upon centuries, during which the annual melting of the snows upon the mountains and highlands, besides the rainfall and the perennial streams which drain into this basin, have brought down in the water from the strata of salt through which they pass these tremendous quantities of salt in solution. The summer sun has dried up the water by evaporation and left the salt deposit lying upon a soil more or less saturated with moisture, this layer of salt thus deposited has gained in thickness and consistency year by year till it has become a solid homogeneous mass too firmly bound together in the parts distant from the edge where its thickness was most (owing to the greater depth of water which accumulated there, and consequent larger amount of salt deposited) to be broken by any pressure of water from

below. The perennial streams have thus poured their waters underneath this strata, as the accumulation of water would naturally commence at the lowest part of the hollow, which would be about the middle of the salt plain, while the floods of water brought down by the rain and melting snow would overflow on to its surface from the margins. This is the only way by which it occurred to us that we could account for the dead level of the crust which, though covering a space of ground more or less hollow in its nature, as was evident from the run of the water all round, did not appear to us to slope in any direction, and also for the fact that on piercing through this crust water spouted out from below. Though we had no ocular demonstration of this fact, we were satisfied that it was the case from the accounts of a party of our servants whom we sent out the following day, when we had reached the further edge, to bring us a block of salt at a distance of a mile or two from the shore; another fact in support of this theory was that nearer the edge where the crust was thinner and thus unable to resist the pressure from below, it had evidently been burst by the rising of the water during the winter and spring, and lay tossed about in fragments.

After this halt we continued our march and arrived at the farther margin about 3 a.m.; it had thus taken us a good eight hours to cross this plain of salt, so that the distance traversed could not have been less than about 20 miles. As we expected, we found that, as we approached the farther side, the crust of salt got thinner and thinner till, on one occasion, getting slightly off the track, we quickly found the horses and mules sink through it up almost to the girths, in a substance that resembled exactly melting snow, out of which we had to make the best of our way towards the harder material upon which we had been marching for so many hours. At length we hit off the beaten track which had been hardened by constant use during so many centuries, and were thankful indeed when we found ourselves again at last on *terra firma*.

Arriving at the farther side we found the ruins of another caravan-sarai, with a well near containing just sufficient water to assuage the thirst of our poor beasts after their continuous march for twelve hours. The powers of endurance of the mules were quite marvellous, for they did not seem a bit tired; this may have been because the surface of the salt presented them with a hard even surface eminently suited for their footing, for they stepped out across it at a tremendous pace. None the less, however, we were all glad of a rest after having covered a distance which could not have been far short of 50 miles since the preceding morning. As day broke we observed about four or five miles farther on what looked like an extensive oasis with the ruins of another caravan-sarai near it, and we determined to move thither in preference to remaining as we were with absolutely no protection from the sun. The oasis we found to be much exaggerated by the mirage, but still

there were present a few stunted trees, running water, and some fields of grain; we accordingly pitched our tents there and determined to halt a day to repose ourselves.

This day's rest is always associated in my mind with the pleasantest recollections—the shade of the trees, the noise of the running water, the greenness of the little patch of cultivated ground surrounding our tents, always recall the most delightful sensations of ease and comfort after the preceding five days' march through rocks and deserts. The coolness of the air, too, was most surprising, for all day long we were able to sit out in the shade of a thin awning, with our heads uncovered and enjoying the most delicious breeze. We noticed in fact, that whenever we came within reach of the wind blowing over the plain of salt, the air was exceptionally cool and fresh; this was probably owing to the fact that such a vast surface of salt must absorb an immense amount of moisture which the dry and hot air of the desert blowing over it must cause to evaporate quickly, and thus lower the temperature of its own atmosphere considerably.

On April 19th we left Marinjab, as this little oasis is marked upon the map, and struck out almost due west, with a view to following the southern margin of the Darya-i-Namak. This, however, we could not keep in view for more than about eight or ten miles, as the ground for a long distance from it was unfitted for the footing of our mules, or indeed of any animal; we were thus obliged to turn off to the south-west, and gradually lost sight of it till it disappeared altogether. As it was, our path to the nearest well, which was called Chah Taghi, lay amidst deep sand, which it was very difficult to make our way through. It is curious to notice that while to the north of the Darya-i-Namak no sand is visible, the whole of the southern side is covered with huge sand-hills, which stretch from fifteen or sixteen miles inland; it was through the outskirts of these that we marched, and hard work it was for our beasts plodding through such heavy ground.

As the day grew, moreover, the wind rose and the air became filled with particles of sand, which inflamed the eyes, so that for a couple of days they did not recover from its effects.

After struggling on for twenty-four miles, as far as we could reckon, we arrived at the well, close to which we found the remains of another old caravansarai, which had been completely swallowed up in the sand with the exception of two rooms, the only means of access to which was through the roof. Here we had great difficulty in pitching our tents, owing to the high wind and the lightness of the soil, which gave no grip to the tent-pegs; however, we succeeded at last, and as the sun set the wind fortunately went down, and we were able to rest through the night in peace. The next day's march brought us within a few miles of Kashan, into what might be called the more civilised part of Persia, and our experiences of the desert thus came to a close.

Returning from Ispahan about a month later, I determined to endeavour to march from Kashan directly by the western margin of the Darya-i-Namak, and thus define more exactly its extent; but this unfortunately I was unable to succeed in doing, for when I got within a day's march of the Pul-i-Dalak my muleteers refused to go on any farther in that direction from fear of their mules being swallowed up in the morasses along the margin of the salt, and I was thus obliged most reluctantly to give up the idea and strike off to the west to join the main road at Kum. I saw enough, however, to satisfy me that the Darya-i-Namak is separated by many miles of interval from the lake recently formed along the road between Kum and Teheran. I found also that the position of many of the villages which I passed was very incorrectly laid down upon the existing maps.

Leaving the main road to the left, I struck off almost due north from Kashan. For the first 15 miles or so we passed through fairly well cultivated land; we then entered upon the desert and camped for the night at a well distant about 30 miles from Kashan, the site of a former village called Mubarakabad.

The next day we marched through nothing but desert without a sign of water for about the same distance, and camped for the night at a hamlet called Daulatabad; from here the gilded dome of the mosque at Kum was visible about 10 or 12 miles to the west. Here the muleteers struck, and I had no choice but to go into Kum.

The foregoing narrative must be taken strictly as that of an amateur. I can only relate what I saw, for I took no observations of any kind. Captain Vaughan, whom I accompanied as far as Kashan, was provided with a plane-table and surveying instruments, and made a careful survey of the route to Kashan, ~~via~~ the Darya-i-Namak; he would be able to supply the Royal Geographical Society with a far more valuable and authoritative account of the march above described. The only points which I wish to draw more particular attention to are:—

1. That what is generally described as the Great *Salt* Desert of Persia is not necessarily *salt* throughout its extent.

2. That what is described as "Kavir" is a saline efflorescence very commonly found in parts of Sind and the Punjab. In Sind it is known by the term "Kullur."

3. That the Darya-i-Namak is an instance of a salt formation quite distinct from the ordinary "Kavir."

4. That the swampy ground into which the rivers crossed on the road between Teheran and Kum empty themselves is to the south and south-west of the Siah Kuh range, and not to the north and north-west of the same.

5. That this swamp is divided into two portions—(a) the Darya-i-Namak, into which as I believe two of the rivers empty themselves, and (b) the New Lake which is of very much smaller dimensions and separated from the Darya-i-Namak by some miles of dry land.

Note.—I have deposited in the Map Room of the Royal Geographical Society specimens of the salt collected at different points in the Darya-i-Namak, in the course of our march across it. In a bag labelled A is a sample taken at a distance of about eight miles from its margin, as described at p. 653. In that labelled B is salt gathered at a point about three hours' march distant from the preceding. At both these places the salt deposit appeared to be of very great thickness. Bag C contains salt taken about a mile from the margin, where the thickness of the deposit did not appear to be more than about two feet, and the salt was soiled by contact with the earth.

A Journey through part of Somali-land, between Zeila and Bulhar.

By Lieut. CHARLES G. NURSE, Indian Staff Corps.

Map, p. 700.

ALTHOUGH a British protectorate has existed in Somali-land since the evacuation of the country by Egypt in 1884-5, and Indian troops are stationed at three places on the coast, the country is not nearly so well known as it should be. Part of it has been roughly surveyed, but even the most recent maps are by no means accurate. The coast-line on the charts is so inaccurate that I was informed by a naval officer that on laying down his position when anchored off the coast, he found it to be, on his chart, some distance inland, instead of about a mile out at sea. During the past three or four years, although several shooting parties have visited the country near Berbera, I believe little or nothing has been placed on record regarding the country and tribes visited by them. Mr. James's book, 'The Unknown Horn of Africa,' gives an account of a journey into almost unknown territory to the south-east of Berbera, but this is, I believe, the only recent publication on the subject, and does not deal with the country between Berbera and Zeila, which is more subject to British influence than any other part. The Aden Residency has of course a considerable amount of information regarding the Somali country, but much of this is, for various reasons, not available for the general public. The scanty nature of available information, and the desire to arouse greater interest in this part of Africa, must be my excuse for giving the following account of a short journey through a portion of Somali-land.

In October 1890 I was ordered to accompany Colonel Stace, C.B., the political agent, to Somali-land, with an escort of about thirty men. In order that the object of our journey may be clear, I must, at the risk of repeating what is already well known, give a short résumé of previous events.

When Egypt evacuated the country it was taken over by England

for various reasons, but chiefly to ensure the meat supply of Aden not being cut off in the time of war. The towns of Zeila, Bulhar, and Berbera are now garrisoned by Indian troops, and the administration is carried on by British officers. The language of the natives is Somali, but Arabic is understood by many of those who live near the coast, especially in the towns. The natives of the interior are divided into numerous tribes and sub-tribes, and raids of one on another are of frequent occurrence. The British Government does not interfere in this intertribal warfare, so long as the towns on the coast remain unmolested, and provided that the caravan routes remain open. In the summer of 1889, however, a portion of the Eesa tribe made a raid on the town of Bulhar, and killed upwards of sixty men, women, and children. In consequence of this and other outrages, a small force of about 350 men, consisting of Indian troops with a few sailors from H.M.S. *Ranger*, was despatched from Aden in January 1890, to punish the tribes concerned. The force was too small to inflict severe punishment on an enemy unhampered by transport in such a country, but in spite of difficulties as to water-supply, &c., a fair measure of success was attained, and eventually the tribes implicated in the above-mentioned outrages sent in to sue for peace.

It was considered advisable to extend British influence as far as possible while the effects of the expedition were still fresh in the memory of the natives, and to endeavour to put a stop to intertribal raids. The political agent, therefore, invited all the tribes to send representatives to meet him, and discuss their differences and all matters relating to their interests and the interests of trade. Accordingly we started from Aden on 16th October, and sailed in the first instance for Zeila. After visiting the boundary between French and English territory, which is situated near this town, and arranging matters as far as possible with the tribes here, we sailed for Dunkaraita, or Dungarita. We had arranged for camels and provisions to be sent to meet us here, and on our arrival found them waiting for us. We were unable, however, to start at once, as the headmen of the Eesa tribe whom we had seen at Zeila, refused to come and meet the other tribes in the interior unless we brought one of their chiefs, who had been one of the leaders against us in the early part of the year, and who had since been detained at Bulhar to keep him out of mischief. He had been sent to meet us, and consented to go by sea to Zeila, and thence by land with the other headmen to the place appointed for the "palaver." I mention this to show how distrustful the Somalis are; conscious of being untrustworthy themselves, they are always suspecting others, and fear being led into a trap. All these negotiations took time, and though we landed the men and baggage at Dungarita, we did not start inland till October 21st.

A few words on the Somalis generally will here not be out of place. The boundaries between the territory occupied by the different tribes

are not strictly adhered to, nor are they clearly defined or known, and this is the cause of much intertribal warfare. All the tribes are pastoral and nomadic, and if the rain is not plentiful in their own part of the country they often wander into the territory of others in search of pasture for their flocks. Then a collision occurs, and blood-feuds are occasioned, which cause still further strife. The Eesa are perhaps the most formidable tribe in this part of Somali-land; they almost invariably attack by night, but they fear the Habe Awal horsemen by day, as they possess scarcely any horses. These two and the Gadabursi are the principal tribes here, but all are divided into numerous subtribes. Into these subdivisions, or into the numbers of the various tribes, I will not attempt to enter, as they are very imperfectly known to the Somalis themselves, and information given on these points is often far from accurate. As the temper of the tribes in this part of Somali-land is very uncertain, we took with us wire and strong posts to form a good wire entanglement round our camp, to guard against possible night attacks. We also carried ten lamps, especially made for the purpose of throwing a good light round our camp or zariba. These precautions are very necessary in a country like Somali-land, and the lamps especially gave the sentries confidence.

There is no village at Dunkaraita, and it is only by two palm-trees growing together close to the shore that it is possible to recognise the place. The landing is on an open beach, and there is often a considerable amount of surf; men had to enter the sea to their shoulders to carry ashore our baggage, and the horses were thrown overboard, and allowed to swim. The country around Dunkaraita is mostly open plain, but some of the wadis, or dry watercourses, are covered with bushes and long grass. We obtained water a few feet below the surface in a wadi, but it was decidedly brackish. I should mention that we carried water-skins sufficient for two days' supply of water, and rations for fifteen days for the escort, besides a small amount of baggage for each man; this, together with the ammunition, our own baggage, and food carried for the Somalis who accompanied us and were to meet us, brought the number of camels to upwards of forty. This may seem a large number for so small a party, but the Somali camel only carries about 200 lbs. whereas in India a camel is calculated to carry 360 lbs. The camels had no saddles, but as is customary in Somali-land mats were tied on before loading so as form a rough kind of saddle. Although it is rather more difficult to fix bulky articles of baggage on to camels saddled in this manner, yet it seems to a great extent to prevent the backs getting sore, and I scarcely saw a sore back while in the country.

Our first march was only about nine miles; the country was mostly flat, with occasional bushes and trees, and was good going. We halted for the night in the open plain, having brought water with us, and

formed our wire zariba as usual, about thirty yards square inside, sentries being told off to each face. The Somalis who accompanied us made a bush zariba, outside ours, for themselves and the baggage animals. Next morning we started early and marched about fourteen miles to Ossuli or Ussli, which had been selected as the spot for the "palaver," being situated near the junction of the nominal boundary of several tribes. The first half of our march was good going, but the latter part was through thick thorn jungle, and across dry water-courses deep in sand. It was also extremely hot. We saw recent traces of a large number of elephants, and some women whom we met near the water informed us that a large herd had been there in the early morning. Water is plentiful at Ussli all the year round in a running stream of considerable width, but ceases a short distance farther to the east. The water extended for some three or four miles to the westward, and was excellent in quality. To show how little known this part of the country was, even to the Aden Residency, before we visited it, I must mention that during the expedition in the early part of the year it was at one time intended to send a detachment of fifty or sixty men to hold the "wells" at Ussli, as it was believed that water only existed in wells below the surface. Fifty men would not have been much use in holding three or four miles of water.

We halted here on the 23rd and 24th October, and made a strong wire zariba, having to do a good deal of clearing, as the ground was thickly wooded in all directions, except on the hills to the west. White ants were very numerous. While we were halted here, the Ughaz, or chief of the Gadabursi, came in with thirty horsemen. The country of the Gadabursi is very extensive, reaching to the borders of Abyssinia, but they have to pass through the Eesa country to reach the seaports for trading purposes. Those whom the chief brought with him were mounted on strong serviceable little horses, and were good riders. They gave us an exhibition of what they considered horsemanship, coming up towards us at full gallop, and stopping dead when about three yards from us. Their bard also made a long speech in sing-song, setting forth the power of the English, and ending up by saying that they had made a three days' journey to meet us, and were all very hungry. Some twenty representatives of the Eesa also came in, and as they all had to be fed, we were obliged to send a man in to Bulhar to bring more dates and rice. He started at 8 p.m. on horseback, and arrived at Bulhar, a distance of about 60 miles, at noon the next day. We heard that a portion of the Eesa tribe had collected a number of men with the object of attacking us, but from what we afterwards heard, we gathered that they had no intention of assuming the offensive, but feared that we had come to attack them again, and that our "palaver" was only a stratagem to throw them off their guard. During the two days we remained at Ussli the representatives of the different tribes, some 200 men altogether,

held friendly meetings to discuss different matters, but as these discussions seemed likely to be interminable, so long as they all remained comfortably here, and were fed without any expense to themselves, we decided to move on, taking them with us. We therefore marched on to Kabri Bahr, a distance of about 12 miles. This part of the map is accurate, especially regarding the position of the hills. An officer of Royal Engineers was to have accompanied us in order to make a sketch of the country through which we passed, but he was prevented at the last moment through illness. We did not know he would be unable to accompany us until we arrived at Dunkaraita, and therefore we took no surveying instruments, which we much regretted. The first three miles of our march was through a thickly wooded country to the Ussli gorge. The road through the gorge was very bad, and the stream had to be crossed several times. The gorge itself was very picturesque, the hills on both sides rising almost perpendicularly to a considerable height. The pass is about a mile and a half in length; on the further side there was a fair amount of pasture, and here we saw large flocks of sheep and goats, and a few cattle.

There are now very few cattle left in this part of Somali-land, nearly all having died of pleuro-pneumonia, which raged during 1889-90. A mile or so beyond the gorge the country is very barren and rocky for some distance; further on the bush becomes thicker, with high grass, until the Ballai jheel or marsh is reached. This marsh is only of small extent, and the water it contains is putrid, though used by the natives for watering their flocks, and probably also for drinking. Beyond the marsh the country is densely wooded, with high trees, till the wadi in which the wells are situated is reached.

Kabri Bahr was found to be 1800 feet above sea-level, and we remained in camp here two days. Our camp here very narrowly escaped destruction by fire. At night the dew was very heavy, and wet everything through, causing several cases of fever. We found the clothes we had brought quite insufficient to keep out the cold at night, though it was intensely hot during the day.

During the time we remained here the representatives of the tribes brought their negotiations to a conclusion, agreeing to abstain as far as possible from raids and encroachment on one another's territory, though some points regarding disputed boundaries were left open. They, however, said that they could not promise that raiding should entirely cease, as a raid was often got up by a few young men of a tribe, anxious to distinguish themselves, and acting against the advice of their elders. We were aware of this, and knew that the nominal headmen, or Akals as they are called, have little real authority in their tribes. But even if no permanent peace can be effected, it was certainly a good thing to bring the tribes together. One of the most intelligent Habr Awal Akals, who spoke Arabic, told me that he had heard about the Gadabursi

all his life, but never saw one of them before. After holding a general durbar, the headmen were dismissed to their tribes, some of them going with us to Bulhar to return by sea.

On October 27th we marched about 10 miles, pitching our camp to the south of Jebel Gumbur Bur, and carrying water with us, as no water is to be found *en route*. The Somalis who acted as our guides, seemed to have a very poor knowledge of the country, and scarcely ever knew where we should obtain water. The first half of this march was through thick jungle, and the latter part up the dry bed of a stream. The map in this part, as regards the position of the hills and their names, is fairly accurate. The next day we marched about 14 miles to Biji. There is no water on the way till the last three miles, where it is found in several places along the Wadi Waranwis.

Biji is 1200 feet above sea-level. We halted here one day, and then marched about 11 miles to Kerbilleh, the road being rather heavy, principally along dry watercourses. Some suspicious looking natives were seen here reconnoitring our camp, and we sent out a party, which followed them to Mount Elmas, and spoke with them. They said they were a band of robbers, who levy blackmail on caravans, and naively admitted that they had been considering the desirability of attacking our camp, but decided that we were too strong for them. We strengthened our camp, but were not further troubled by them, and next day marched to Bulhar, whence we sailed for Berbera in a native boat.

The great want of the country through which we passed is of course water. Of the places we visited, only at Ussli is there a really abundant water supply above ground; in many other spots it can be obtained from existing wells, and still more frequently by digging in the wadis. When it rains heavily on the mountains to the south of Somali-land, these wadis are often converted suddenly from dry places into raging torrents, although perhaps no rain may have fallen, except in the hills. After the water has passed, carrying everything before it, the wadi becomes in a few days as dry as before. We saw no signs of attempt at cultivation anywhere, and the country is generally unsuited for it, though there are some spots which might possibly be cultivated on the system in vogue in Southern Arabia. A large proportion of the plants and trees are more or less thorny, but there is good pasture for sheep and goats in many places, and almost everywhere sufficient for camels. The castor-oil plant grows freely on the banks of most of the wadis; the natives might make something of this were they not too lazy and indifferent. The myrtle also grows in many places. We were always able to find plenty of dry wood for firing, but saw few trees suitable for timber. The heat near the coast was considerable, especially before 10 a.m., when a sea breeze generally springs up. Game was fairly abundant: we saw traces of elephant, lion, ostrich, koodoo, hyænas, and oryx; and shot several kinds of deer, bustard, florican, hares, guinea-

fowl, sand-grouse, and other game. I also saw a large sounder of wart hog near Dunkaraita.

In conclusion, I must state that since we visited this part of Somali-land raids have not entirely ceased, but I believe they have occurred less frequently than before, and the natives are beginning to see how much better it would be for all parties to abstain from fighting. The ports of Berbera, Zeila, and Bulhar have considerable trade, which is increasing every year. The principal exports are sheep and goats, gum, hides, and coffee (from the interior), and the chief imports are dates, rice, and other food-grains, piece goods (mostly American), salt, &c. Intoxicating liquors are not used by the Somalis, nor is tobacco, except by those who have acquired the habit among Arabs. The Somali of the interior has few wants at present, but among those who live near the coast and in the ports, a demand has begun to arise for European goods, and this will doubtless increase as civilisation advances.

Notes on the Sabæans.

By Dr. A. HOUTUM-SCHINDLER, F.R.G.S.

IN a note on the port of Muhamrah ('Proceedings,' 1891, p. 297), I see a remark on the Sabæans, and the expression of a desire for some information. For readers who will content themselves with some little information on the subject, the following extracts from my note-book may be of interest, and for those who wish to study the subject further, I attach a bibliography.

Mir Abdul Latif Khān Shushtarī, a Persian author who wrote at the end of last century, says as follows in his 'Toḥfat ul 'Ālem': "Some unbelievers called Ṣab'ah live at Shushtar. Their religion is considered to be a mixture of the Christian and Jewish faiths. They are not the planet-worshippers mentioned in the Gor'ān, for they do not worship the stars. They also are not idolaters, and are neither Christians nor Jews. One of their customs is to go every morning into the river up to their waist, look towards the sun and pray, wash themselves, and then go away. Most of these people are goldsmiths, and some are clever agriculturists. One of my relatives frequently conversed with them, and asked them questions as to their faith. They said that their prophet was John, the son of Zacharias, and that Jesus, the son of Mary, had been one of his principal disciples. One man gave out that Ibrāhīm Khalil Ullah (Abraham) was a son of John's maternal aunt, and that he brought up and educated John. My relative questioned these people many times and wrote down everything they said, but their statements varied every time. This religion exists only in Khūzistan, and not in any other part of Persia. Some people have

called them Majûs (Zoroastrians, Magi), others Indians and idolaters; and in Bengal there are at the present time some people who practise some of the ceremonies of the Şab'ah, principally the praying in the river and looking towards the sun. Others say that the Şab'ah are followers of Şâb, the son of Idris (Enoch), but these are the star-worshippers who consider Adam their first and Şâb their last prophet."

I, too, like Mir Abdul Latif's relative and many other travellers, found that the statements of the persons I interrogated varied very much, and most of my informers were densely ignorant. Much of the ignorance was, no doubt, affected, and many of the false statements were, I am afraid, wilfully made. The Sabæans do not like Christians, and are very suspicious of strangers. "It is a slippery task to ascertain the creed of an ignorant people, afraid and ashamed to disclose their secret traditions." *

The real name of these people is Mandaï Yahyaï, "followers of John." One of their priests told me that "Mandaï" meant "uncut," that is, "not circumcised." The educated Persian calls them Şâbi, plural Şâbi'ân, Şâbi'in or Şubât, meaning thereby Sabæans or star-worshippers, and deriving it from Arab Şabâ, the stars, or heavenly host; but Noeldeke says the word is Şabiyûn, meaning baptists.† At Dizful, Shushtar, and Muhamrah, I generally heard them spoken of as Sâbegî and Sabukî, the "ancients" and the "light ones," both of them evidently nick-names. European travellers often give them the name of St. John Christians, but this is altogether wrong, for their faith has nothing in common with Christianity.

The origin of the Sabæan community, or, more correctly, of the Mandaïs, is very obscure. Some consider the community a remnant of the old polytheistic Sabæans of Arabia, but if we place any credence in the statement of Abû Yûsuf (quoted by Ritter, vii. 2, p. 307), we must consider the Mesopotamian Sabæans as a distinct sect having no connection with the Sabæans. From Abû Yûsuf's statement it appears that the Mandaïs or Shemsiyehs of Harran, being threatened with persecution if not extermination by the fanatic Al Ma'mûn shortly before his death (A.D. 833), and when an army had already been prepared to march against them, declared themselves Sabæans. By this act they avoided persecution and became Zimmis, i. e., members of one of the religions mentioned in the Gor'an and enjoying the right of protection by the Muhammedans, on condition of paying the jezîeh or

* Gibbon, ed. London, 1855, vol. vi. p. 214, note.

† Ibn Khallikan under Abû Ishâq as-Sâbi (De Slane's translation, i., 32), says: "Some say the word comes from Şâbi, son of Methuselah, son of Enoch; others derive it from As-Şâbi, son of Mâri, a contemporary of Abraham; others, again, say that the word Şâbi, was used by the Arabs of the desert to denote a person who abandoned the religion of his people, and for this reason it was that Muhammed was called Şâbi by the tribe of Koreish." The star-worshippers are mentioned in the Gor'an as Şâbi'in (Sûra ii., 59) and Şâbi'ân (Sûra v., 73).

poll-tax. Christians, Jews, Zoroastrians, and Sabæans had this right of protection. Abū Yūsuf adds, "since then these people are called Sabæans (Ṣābi'ūn), although there were previous to this none of this sect in Harran and its neighbourhood." This statement seems to prove conclusively that the appellation of Sabæans for the Mandaïs of Mesopotamia dates from the ninth century. Kremer (*'Culturgesch. d. Orients,'* ii., 171) says: "The Sabis have remained faithful to their old idolatry, but were successful in obtaining the protection of the state, although as believers in a religion not based on revelation they had no right to this protection." Some of the Mandaïs probably at the same time declared themselves Christians and affected the use of the Christian symbol, the cross, as some of them do to this day; or, this use of the cross may be a remainder of the Mandaïs' forcible conversion to Christianity by the Portuguese in the sixteenth century. With the departure of the Portuguese from Basrah the Mandaïs gave up Christianity, and, from several remarks made to me, I am inclined to think that Christians are detested by all true Mandaïs.

In 1877, the date of my first visit to Mesopotamia, there were living of the Mandaïs seven families at Dizful, two at Shushtar, 120 at Sūg ush-Shuyukh, 130 at Kūt el 'Amāreh, 30 at Muḥamrah, 10 at Havizeh, 50 at Basrah, and 200 in various Arab camps on the banks of the Tigris and Shatt ul 'arab—about 550 families altogether. In 1886 the same number were given to me. The Mandaïs declared themselves as having no connection with the Shemsīyehs of Harran. Their chief priest, or sheikh, resided at Kūt el 'Amāreh on the Tigris, and one of his men was good enough to sell me a MS. copy of a Ṣidra for 5*l*. This Ṣidra and the other four books of the Mandaïs (Divan, book of John, Golasta, book of Zodiac) are in a dialect of the Aramaic language, containing a large number of words borrowed from the Greek, Latin, Arabic, and Persian; and the writing, which is more like that of the Syriac and derived from the Estrangelo, was an alphabet of 22 characters and differs from the other Syriac writings principally in that it writes all the vowels long or short.*

The Ṣidra is certainly not an ancient book, as it contains several allusions to Muhammedanism.

* To the East-Aramaic languages belongs the Mandaic or Sabian, i. e. the dialect in which are written the holy books of the Mandaïs. These books, which contain gnostic myth and philosophems like the Zendavesta, are, in their present form, more recent than the origin of Islam, but their language, as well as their ideas and historical allusions, point to a more early origin of the principal text, and probably date from the first centuries of the Christian era. The peculiarity of this dialect, which is closely allied to the language of the Babylonian Talmud, consists in its gutturals being arbitrarily changed, in contractions, and in interchange and displacement of consonants. Many words have been borrowed from the Persian. The 22 letters of the alphabet express all vowels, and the vowels are, like in Æthiopian, joined to their consonants. (Gesenius, *Hebr. Wörterbuch*, Leipzig, 188*c*.)

I was told that men were divided in three classes, viz. genzebrâ, priests; tarmîdi (aram. talmid) disciples; mandaïs, laymen. This statement is contrary to what other travellers have obtained. The Mandaïs believe in one God, as the Creator, &c., and in John as the great prophet. The priest, whom I had the good fortune to meet, either could or would not explain more. Some of the laymen seemed to believe in a kind of dualism, spoke of the good god and the bad god, and confounded the prophet John with God the Creator, and called him Hîvel Zivo (the power of light[?]) Worship of the heavenly bodies, true Sabæanism, was denied by all I met. The Mandaïs are monogamous, but can remarry after the wife's death. I was told that divorce did not exist, "all marriages being happy ones." The marriage ceremony is performed by a genzebrâ. Children are baptised forty days after birth, and then also receive a name. The mother is purified the same day. There is no circumcision. Priests are robed in white. Bodies are washed immediately after death and buried in a coffin without much delay. Prayers are held on Sundays. Women are not considered impure, and generally take their meals together with the men. (This is contradictory to Tavernier's statement.) The men I saw were not tall—the tallest had a height of five feet eight inches. Men and women were dark-skinned, and resembled much the lower class Arabs of Mesopotamia. Most of them follow agricultural pursuits; at Muḥamrah and Basrah some of them are gold and silver smiths. They are fairly well treated by the Persians and Arabs, but are very poor. Those occupied with agriculture have a yearly income of 8*l.* to 10*l.* The priests have not much more, and are kept from starving by small contributions in cash and kind from their people.

I made inquiries as to their calendar. Some said their era was that of St. John, which commenced 10 years before the Christian era, others said they reckoned from the Hijreh, and this I consider more correct.*

Their months were given me as follows:—

Nēsân, with symbol 'ambra.	Tashrin, with symbol ghêna.
Ayâr " tôra.	Mashravân " 'argaba.
Sevân " silmi.	Ganûn " heptia.
Têmûz " sartavna.	Tavith " gaddia.
Âv " ariâ.	Shabad " dola.
Elâl " shumbulta.	Adar " nona.

The names of the months are the same as those of the Hebrew calendar with the exception of that of the ninth month which in the

* This is proved by the MS. which I obtained from Kût el amâreh. It was written for Yohânâ, the son of Tappal the smith, residing at Sûg ush-Shuyukh on the Tigris, by Magsûd, the priest of Shushtar, in the year 1166. The scribe speaks of troubles at Shushtar caused by the lûtis, persecution of the Mandaïs, &c.; and from the names and titles of the various Persians, governors, and others mentioned, it is evident that he speaks of events which happened at the beginning of Kerim Khan's reign, and that the year 1166 is the Hijreh year, equivalent to 1752-1753 of our era.

Hebrew calendar is Khislev, or the same as those of the Syrian calendar with the exception of the third, eighth, and tenth months, which in the Syrian calendar are named Ḥeziran, Tashrin II, and Ganûn II. The symbolic names are those of the signs of the Zodiac, and it is important to note that Nesân, or the month which is equivalent to the period of the sun in Aries—the Mandaic 'Ambra—now falls in October and November instead of in March and April. The names are mostly Aramaic.

The Mandaï year begins with Nesân and the first of that month of the Mandaï year 1887 (era of St. John), or, as others had it, of the year 1294 (Hijrah), fell on the 20th October, 1877, of our calendar, and on the 13th Mar Keshvan of the Hebrew calendar. According to Thevenot the first Nesân in the Christian year 1665 fell on the 13th October—the Mandaï calendar has therefore gained on the Gregorian calendar seven days in 212 years.

I was unable to learn for certain what the Mandaï year was. Some said it was the same as the Shemsiyeh year, 12 months of 29 to 32 days each, 365 and 366 days; others that they used the Syrian year. Neither explanation accounts for the gain of seven days in 212 years, unless we suppose that they seven times missed intercalating a day in the bissextile years. Their year is, I believe, the solar one of 12 months of 30 days each, with five intercalary days every year and one day extra added every fourth year. Only the sheikh at Kût el Amareh was supposed to know all this. Some also counted cycles of 12 years, and gave to each year the name of some animal, in a similar manner as does the calendar in use in Central Asia.

They celebrate three great festivals during the year—New Year's day, Tirmâh, and Panjâh. The first which they call Dehvâ Rabba, also Nôrûz, coincides with the old Persian Nôrûz, New Year's Day, on the 21st March, the vernal equinox. The second festival fell in 1877 on the 19th November. No one was able to tell me its *raison d'être*, but it evidently is the old Persian or Parsi festival—which fell on the same day—in commemoration of the division of the Persian Empire by Feridûn among his sons. It is the 13th day of the fourth Parsi month, the day Tîr of the month Tir. The third festival, the Panjâh, was, they told me, the anniversary of the baptism of Jesus Christ by John. It lasts five days, and its first day in 1878 fell on the 18th April, and coincided with the first of the five epagomenous days at the end of the month Abân of the old Persian calendar. It appears, therefore, that their three great festivals are Persian. Thevenot explains these three festivals as follows: 1, beginning of New Year (three days), creation of Adam; 2, at beginning of fourth month (three days), festival of St. John; 3, at beginning of sixth month (five days), baptism of Jesus Christ.

From the 19th November to the 19th December, 1877, the Mandaïs of

Dizful fasted, but they did not know why. The old Arab Sabæans celebrated the sun's entrance in Aries, the vernal equinox; fasted for 30 days before it, and during their prayers turned towards the sun; the Mandaïs, therefore, have something in common with the old Sabæans.

The names of the week days were given me as follows: Hebshaba, Sunday; Ateren Shaba, Monday; Thelatha Shaba, Tuesday; Arbâ Shaba, Wednesday; Hamsha Shaba, Thursday; Urupta, Friday; Shafta, Saturday. Each day is under the special protection of one of the old seven planets, viz. Sunday is under Shâmesh, the sun; Monday under Sên, the moon; Tuesday under Nêrig, Mars; Wednesday under Anvu, Mercury; Thursday under Bel, Jupiter; Friday under Levath, Venus; and Saturday under Kivan, Saturn.

So far my note-book. For further details the following books should be consulted.

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TEHERAN, July 5, 1891.

Photography and Exploration.

By JOHN THOMSON, Instructor in Photography to the R.G.S.*

My object in preparing the following paper is twofold; first to show the growing importance of photography in its application to science, notably to geography; also to urge explorers to avail themselves more fully of the great advantages which a knowledge of photography secures, in enabling them to illustrate their route and register their observations.

The camera affords the only means, with which I am acquainted, of portraying visible objects with scientific accuracy. Every photograph taken with an achromatised and corrected lens is a perfect reproduction to scale of the object photographed, as seen from the point of view of the lens. The fixed laws which govern the formation of an image in the camera enable the cartographer to reproduce, to scale, maps and charts either larger or smaller than the originals. This has almost entirely superseded the old elaborate method of reproduction, which involved the most tedious draftsmanship and processes of measurement. A map may now be enlarged by a single operation in the photographic camera, and transferred to the printing press. Were it not for such discoveries as this, we could not keep pace with modern progress, or register its achievements. Such an advance, coming when it does, must be set down as a natural process of evolution.

Be that as it may, photography is a power placed in our hands, of which, I fear, we are too slow to avail ourselves.

On the Continent and in America, there is what has been termed photogrammetry in use among engineers in doing surveying work, which might be accomplished by other means but with an infinite addition to cost and labour. In this eminently conservative country we, with all our solid progress, are woefully burdened with the impedimenta of custom. Farmers, for instance, when grain is a drug on the market, continue to grow cereals at a loss, though assured that the culture of fruit would prove a lucrative industry.

I know of no reason why photography should not find favour with the pioneer whose object is to map out a new route and to picture to the

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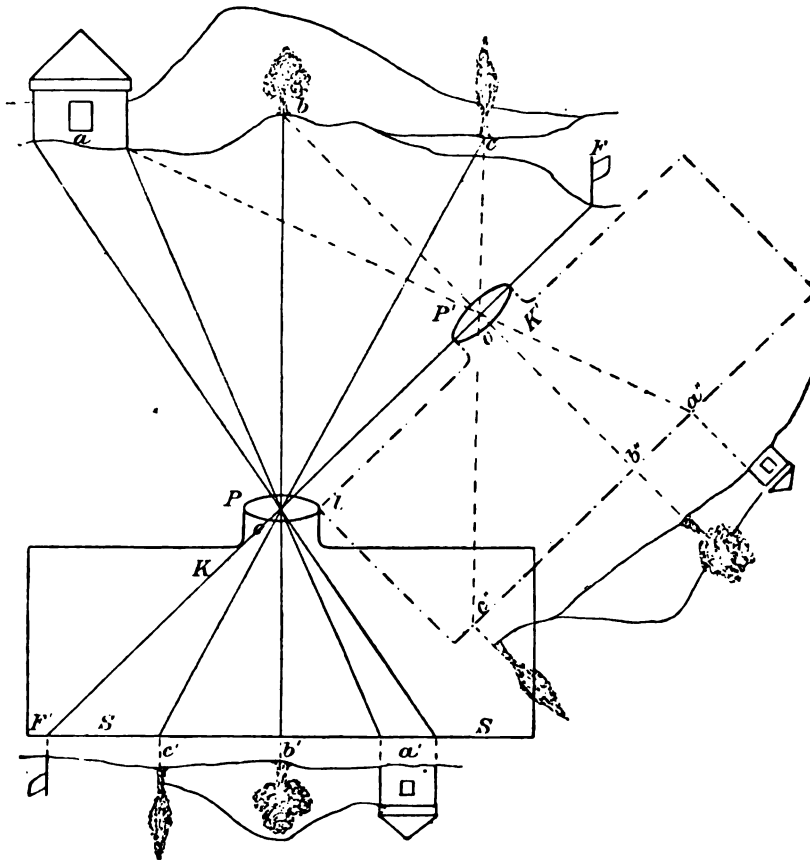
scientific world at home, in a trustworthy manner, what he himself has observed during his travels. So far as my experience goes, pen and pencil have done the work, with rare exceptions, which might have been more satisfactorily accomplished by series of well-executed photographs. It is quite impossible to illustrate by pencil, with any degree of accuracy, or to describe in a perfectly realistic manner, scenes and incidents by the way so as to render them of permanent value. Lack of time and opportunity constrains the gifted traveller, too often, to trust to memory for detail in his sketches, and by the free play of fancy he fills in and embellishes his handiwork until it becomes a picture of his own creation. An instantaneous photograph would certainly rob his effort of romance, but the merit would remain of his carrying away a perfect mimicry of the scene presented, and an enduring evidence of work faithfully performed. He would for ever banish doubt and disarm the captious critic. If his object be to write a romance of travel, a fertile imagination may supply the material without his stirring from his study chair.

In all serious scientific work an accurate method of recording observations is of primary importance. Astronomical observations, when properly made abroad, may be verified at home and positions set down for guidance in cartography. Such observations, and the registering of altitudes above the sea level, are matters which require a separate scientific training; when, however, they have been made, and positions set down, there remains much and important work to be done in detail in regard to the topography of a region. Such work, I maintain, lies within the scope of photography, and it is to this phase of usefulness I would first direct your attention.

The instruments at present employed in photogrammetry would be too elaborate for use in exploring, but such a compromise might be effected in their construction as to render them portable and serviceable for the initial work of the pioneer. In place, for example, of a combination of camera and theodolite for securing accurate horizontal and vertical angles, an ordinary camera might be fitted with a level, compass, and vertical and horizontal protractor, each having accurately adjusted sights. In conjunction with this, the prismatic range-finder would supply the means of measuring the base line from the two extremities of which line a photograph should be taken; the measured line would supply the scale on which a map might be filled in in detail from the photographs.

Dr. Vogel gives the following description of this method:—"All photographic views are produced by means of lenses. A lens view of this kind is always an exact central perspective; that is, each point of view lies on the straight line which can be drawn through the optical centre of the lens." Let abc be three objects of nature, K a camera (of which the outline is given to facilitate comprehension), and l its lens.

Then the images of the different objects are situated on the produced short lines $a o$, $b o$, $c o$, that is to say, on $a b c$; therefore, they have, in the picture, exactly the same relative position as in nature. Accordingly, a good photograph can serve to determine accurately the position of objects in nature—that is, to construct maps of the piece of ground that has been taken in the view.



For example, let the reader conceive an image, which stands upright in the camera of the diagram annexed, brought down flat upon the paper. Then in the middle of the field of view, at the tree b' , let a perpendicular line be drawn equal to the focal distance $o b'$. It is only necessary, after this, following the figure, to construct the lines $c' o$ and $a' o$ $F' o$, in order at once to find the directions in which the tower, the flag, and the trees will be seen from the position P . If now a second view be taken from a point P' , which lies in the direction of the flag F , a second view is obtained $c'' b'' a''$ which naturally looks quite different from

the first, in consequence of the change of position. If this view from the second position be also brought down to it, and a line $b''o$, equal in length to the focal distance, be drawn to the second position, then the lines $c''o$ and $a''o$ give again the directions of the lines from abc . If these lines be sufficiently produced on the paper, they intersect at points the situation of which corresponds exactly to that of the object; and thus, in two views at two points, the means is afforded of constructing a map in which the situation of all points contained in both views is exactly given.

A different procedure is followed in ordinary trigonometry. In that science, the first step would be to measure the distance PP' , then to set up an instrument for taking angles at P , and to determine the angle made by the line PP' with the lines ao, bo, co ; the same operations being repeated at the other end of what is called the station line PP' . It is evident that as many measurements must be made at both points as there are objects of interest, whereas a photographic view taken, once for all fixes all objects correctly in their relative positions. Accordingly, there is a considerable economy of time in applying photography; and this is of great moment in war, when frequently, in consequence of interruptions on the part of the enemy, the leisure is wanted which is necessary for triangulation; also in journeys, when the stay at particular places is too short to make observations requiring time.

Therefore this process has great advantages in exploring expeditions; and landscapes taken photographically have a twofold value: not only do they give a view of the country, but also data for the projection of maps.

Now I come to other services which photography may render in the course of a journey of exploration.

In order to obtain a basis of measurement for any object to be photographed, a very simple device may be employed. If the object be ethnological, to wit, a racial type, where it is necessary to take a full face and profile view of the head, or a series of overlapping views of a number of types of the same family; a rod marked with one space of definite measurement will supply the required authority. This rod should be so placed in relation to the head, that it will fall into a plain bisecting the cranium about the ears for full face, and the nose for profile. The rod must then be photographed with the type, and the result will give a basis of measurement. This applies to full length figures as well. Its use may also be extended to any object where the value of the observation depends on proportional measurement; in geology, depth of strata; in botany, the diameter and height of trees, the dimensions of blossoms and of fruit, and indeed to all near objects measurable which cannot be carried away. The more general scientific use of photographs may be indicated in taking evidence of the effect of erosion in drainage of mountain chains, the building up of delta by the detritus of rivers, the hydraulic force of streams in undermining and altering

formations, evidence of volcanic actions, of the action of glaciers, and the general geological characteristics of a region.

In botany it affords a fitting means of representing the zones of forest growth in mountain chains, the fertility or sterility of a region, and the indigenous products of a country, in the interests of science or commerce.

For military purposes, available passes in mountainous regions, water supply, cover, roads and foot-paths, cities and villages, rivers, their fords or bridges, and floating defences and forts, and extent and strength of land defences. Native weapons and implements of war. So one might catalogue the possibilities of this power which is placed at our disposal, and which has been treated, at times, with some degree of scorn and disfavour, probably because of the fatal facility it offers to amateurs to produce bad work. Where truth and all that is abiding are concerned, photography is absolutely trustworthy, and the work now being done is a forecast of a future of great usefulness in every branch of science.

What would one not give to have photographs of the Pharaohs or the Cæsars, of the travellers, and their observations, who supplied Ptolemy with his early record of the world, of Marco Polo, and the places and people he visited on his arduous journey?

We are now making history, and the sun picture supplies the means of passing down a record of what we are, and what we have achieved in this nineteenth century of our progress.

Full directions were here given for the training of travellers in photography, how and what to photograph.

It is too often supposed by the traveller that the art may be picked up in an afternoon, and that it is quite fitting that its study should be left to the last moment, as any one can take a photograph! This is an error which I have been combating for years, and without success. Personally I have been practising the art for more than a quarter of a century. I keep plodding on, and trying to keep pace with it, but it forges ahead, and I am left to follow on as best I may.

This need not discourage others, but it may serve as a warning to some that it is not to be picked up casually, like French, in three lessons. Time and care must be bestowed on cultivating the elementary principles of photography, as well as on matters of a more advanced type.

I will summarise, as briefly as possible, the subjects which ought to receive attention.

1. The construction and use of the portable camera best adapted for field work in all climates, so that the student may handle the instrument properly, and have some notion of how to effect slight repairs when accidents occur.

2. The lens and images it projects upon the sensitive plate; how to focus and adjust the image on the focussing screen of the camera, so as to obtain a well-defined photograph.

3. The best mode of packing and preserving sensitive plates or films from injury and decomposition by damp or other causes. Neglect of proper precautions has led to frequent failures. Exposed plates have been lost by repacking with sheets of printed paper between the prepared surfaces. When developed, a strong image of the printed matter came up, but nothing more!

4. Timing exposure of the plate in the camera. There are several ingenious actinometers in use which afford a clue to the actinic quality of light; but for practical purposes experience forms the safest guide. Exposure on what is termed an instantaneous plate varies from, say one-eightieth of a second for out-door work to three or four hours for dark interiors.

5. Development of dry plates. This may or may not be acquired, as the traveller may prefer to store his exposed plates and have them developed by an expert at convenience. It may here be noticed that the dry plate may be kept for an indefinite period after exposure and before development, without detriment to the quality of the photograph, if proper precautions are taken in storage.

6. The character of the work to be done and the method of doing it so as to render all photographs taken available for scientific or artistic use.

This, it may be said, is a rather formidable syllabus, but the knowledge may be readily imparted by a competent instructor to any student accustomed to science training. It is, however, possible to coach the traveller in handling the camera and exposing and storing plates, leaving out much that is technical and theoretical in the practice of photography, and so as to lead to a certain measure of success. Superficial training such as this I do not recommend where thoroughness and good work are required. I must also add that no good workman, who has realised the wonderful possibilities of his craft, would rest content with a knowledge as superficial as it is unsatisfactory. I look forward to the time when good photographs will be valued as permanent works of reference, and when they will figure in our schools and colleges in place of highly coloured diagrams, as the absolute lights and shadows of all things seen and that are of value in expanding our knowledge of the world in which we live.

In conclusion, I beg to revert for a moment to the subject of surveying by photography. The ideal survey of the future will probably be carried out by an engineer aeronaut photographing from a balloon. Let us suppose that a balloon is anchored by three cords to a space above a city to be surveyed. Suspended horizontally from the car there would be a camera fitted with an automatic shutter, worked from the inside of the car. The operator in the car would watch, through a sight-tube, the moment when the balloon was over a selected centre in the city, and take his photograph; or he might remain in the city and work the

shutter by electric current: he could watch the moment when the camera reached the desired point by artificial horizon.

A series of photographs taken in this way would complete the survey of the city, and might be transferred direct to the printing press. The balloon would of course require to be shifted for photographing each section of the city. Such photographs taken with a rectilinear lens could be fitted together, section to section, with perfect accuracy, and a single photograph afterwards taken from the combined portions, which would form a complete and minutely accurate survey of the city. This plan, without touch of pen or graver, may, as I said, be transferred to a metal plate or to a lithographic stone for printing on the printing press.

*Bar-Subtense Survey.**

By Colonel H. C. B. TANNER, Indian Staff Corps.

THE system of survey which I am now about to explain was introduced by me some years back, when called upon to execute a 4 inch = 1 mile ($\frac{1}{15840}$) survey of the Kangra district, situated partly amidst the snowy regions and partly in the broken hills at the foot of the Himalayan Mountains.

2. In Kangra, and elsewhere in highly mountainous tracts in India, traverse surveys had already been carried out by means of chain measurements before my party was organised. The resulting surveys, which were mainly undertaken for purposes in connection with the fiscal operations of the country, were not free from large errors resulting from the impossibility of obtaining accurate horizontal measurements across slopes intersected by fissures, broken by cliffs, and covered for the most part either by forest or scrub. In such localities a chain line might be run after immense labour, but with a resulting error of such magnitude that only the exigencies of the case rendered it admissible.

3. Several delicate and expensive instruments were already to hand, with micrometer eye-pieces attached, by which, when used in conjunction with bars of known length, a horizontal distance could be measured more or less near the truth; but such instruments were too complicated and delicate in their parts to bear the rough treatment they might receive at the hands of the native establishment to whom I had mostly to look when conducting the Himalayan survey. Besides this drawback, I had not found micrometer instruments capable of yielding results sufficiently accurate for the purpose of obtaining traverse distances within the prescribed error admissible for work on the large scale of 56.7 inches = 1 mile ($\frac{1}{1117}$) which was laid down for the more open tracts that would come under my measurements. The weak point

* Read at the Geographical Section of the British Association, Cardiff, Aug. 21st.

of micrometer eye-pieces for measuring distances lies in the fact that the wires are in different planes, i. e. they are not all exactly in focus at the same time, and this parallax renders them inadequate for the measurement of small angles with the exactness claimed for them by their makers. Micrometers attached to the eye-pieces of small theodolites have three wires, and to enable them to pass each other freely when working the screws so much space has to be allowed that, so far as I am aware, they are fit only for measuring small arcs approximately. Fullest trials under favourable conditions were given these instruments, and after repeating over and over again observations to well-defined signals, the resulting angles were found to be so widely discrepant that I had to give them up; and so long as the error of parallax spoken of above shall remain, so long will this objection to the use of such micrometers be a bar to their use for reliable work of the class now under notice.

4. The Bar-Subtense method which I then introduced has none of the drawbacks attending the use of the chain or of micrometer instruments; it is more accurate than either, and is effected by means of an ordinary theodolite, together with bars of varying lengths, according to the nature of the work to be performed.

5. The system is readily acquired by native surveyors after a week's instruction, and in their hands, over the roughest possible mountain tracts, is capable of furnishing horizontal measurements up to a maximum of some two miles with an error of about 0.5 per mile, or say three feet per mile, and up to a distance of three miles with a somewhat greater error; and an adaptation of the process is capable of yielding reconnaissance traverses and approximate trigonometrical work far more accurately and expeditiously than can be looked for by any other means, unless a regular trigonometrical survey be resorted to.

6. The theodolite used should be six-inch or larger; it should be simple in construction, and furnished with one vertical and one horizontal wire. The bars may be of varying lengths. In the Himalayas the 20-foot bar was in general use, but ten and two-foot bars were found convenient for some purposes. A 20-foot bar with 12-inch circular discs is capable of furnishing, under favourable conditions of light and atmosphere and by a skilled observer, a 3-mile distance with an error of six feet. A ten-foot bar with eight-inch discs will give good results up to a mile and a half, and a two-foot Gunter's scale blackened at the ends with two-inch paper discs pasted on two feet apart, and properly mounted, will give distances up to 20 chains. The latter bar, as used in the Himalayas, I hoped to have been able to exhibit.

7. I may here remark that portable folding 20 and 10-foot bars have not yet been constructed. The former might be designed to fold into seven and the latter into three and a half feet, and still have sufficient rigidity when in use to give good results.

8. The *modus operandi* of a traverse surveyor must now be explained in detail.

9. The forward signalman sets up the horizontal bar over the station mark, and then, by means of the folding sight-vane, directs the bar at right angles to the observer, who then intersects and records the reading of the back signal. Then, leaving the lower clamp fast, he releases the upper plate and intersects the right-hand disc of bar, the reading of which he records.

Now release lower clamp (leaving upper clamp fast) and intersect left-hand disc. Again release upper plate and intersect right-hand disc, and for a second time the left-hand disc with lower plate, and so on, continuing the repetition until, say, ten times, and then read and record the right-hand disc. In this operation the graduated limb of the theodolite will have moved over an arc ten times greater than that subtended by the bar. Now repeat again, ten or twenty times, and record readings of right-hand disc, and then, having taken a vertical angle to bar, and leaving lower plate fast, intersect, and record the reading of back signal with upper tangent screw, and such a record as I here show will have been obtained :—

Signals observed.		Reading of A vernier.	Differ- ences.	Subtended angles.		Error of 20 ft. bar — 0·2 of an inch.
		° ' "	° ' "		' "	
Back station	A	126 14 20				
Right-hand disc ..	B	206 26 30				
" "	B ₂	209 48 30	3 22 0	d	20 12	
" "	B ₃	213 10 15	3 21 45	d ₂	20 10·5	
" "	B ₄	216 32 5	3 21 50	d ₃	20 11	
Back station	A ₂	136 19 55	M 20 11 2 = x.			
(30 repetitions) ..		10 5 35	From Table, Chains		51 60*	
		10 5 35	Correction †		— 4	
Subtended angle ..	x	20 11·2	Corrected distance		51 56	

Traverse angle:—B — A (= B₄ — A₂) ° ' "

$\frac{x}{2}$ — 10 5

Angle at station 1, between back station
and centre of bar at No. 2 } ° ' "

* For actual use the distances have been tabulated between 2 and 180 chains.

† Bar = 20 ft. = 30·3 lks. log. 1·48144
20' 11·2" cosec. 2·23122

51·60 log. 3·71266

10. A 10-foot bar with an error of 0·2 of an inch would give—

Chains	..	..	..	25·80
Correction	..	..	—	·08
				<hr/>
Corrected distance, ch. 25·72				

11. A 2-foot bar with an error of 0·02 of an inch would give—

Chains	..	..	..	5·16
Correction	..	..	—	1
				<hr/>
Corrected distance, ch. 5·15				

12. I wish to draw attention to the complete system of checks on the observations furnished by the above record. In the first place there are two values of the azimuthal or traverse angle $B - A$ and $B_4 - A_2$, both of which should nearly correspond, and show only trifling differences.

13. The subtended angle, or α , which is D divided by the number of repetitions, should correspond very closely with d_1 , d_2 , d_3 , and, as a check on the arithmetic, it should agree exactly with the mean of d_1 , d_2 , d_3 . These values are taken out during the progress of the observations, and should one of them show even a small discrepancy, the work must be condemned and done *de novo*. Again, $A_2 - A_1$ and $B_4 - B$ must agree very closely. The checks are such that, by examining his record, the observer can make certain before proceeding to his next station that he has obtained the correct distance. Up to a mile he can detect any error made by the signalman in placing the bar at right angles, for it is only when exactly set that the black lozenge at the end of the sight-vane of the bar appears to him in the middle of the white patch on the bar itself.

14. The signalman soon learns to place the bar sufficiently near the horizontal for practical purposes. An error of 2° of dislevelment, which would seldom occur in practice, would only produce an error of about three inches in a mile.

15. Such is the mode of procedure to be followed in running an ordinary traverse, and I will now endeavour to show how an adaptation of the method may be made applicable to other classes of survey, such as reconnaissance of an unknown country, and an approximate triangulation.

16. There are two positions in which an explorer or surveyor may be placed: 1st, he may find it possible, before commencing operations, to send signals on a-head into the region he proposes to visit; and 2nd, as when accompanying an army in the field, he may not be able to determine, when at his initial station, the exact direction in which his operations will lie, and the country in his front will be closed to his signalmen.

17. In the former of these cases, having selected some suitable eminence, he will proceed to lay down thereon and measure, by the Bar-Subtense method, two or more short bases, in length according as the configuration of the ground may admit, say of 10 or 20 chains, and after taking a round of angles to surrounding signals and including the signals at the ends of his short bases in the circuit, he will advance to the next station of his series and observe to the signals of A station, treating them in pairs as if they were discs of a bar, and recording them exactly as described for a traverse. (See para. 9.)

18. The configuration of the ground at A station is not likely to have been such that the bases could be laid down at right angles to B, but they would have been placed as near a right angle as possible, when the following computation would be necessary, in order to determine the distance required:—

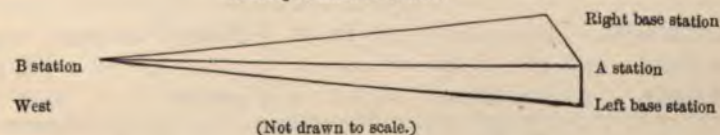
Left hand base. By Bar-Subtense. Chains 12·91. Log. 1·11091.

Names of Stations.	Obsd. angles.	Angles for comp.	Log. sines.	Log. sides.	Chains.
Left Base Stn.	Supplementary	94 13 34	9·99882		
A Station ..	85 10 0	85 9 10	..		
B Station ..	0 37 16	0 37 16	2·96496	3·07469	1187·65

Right hand base. By Bar-Subtense. Chains 19·06. Log. 1·28012.

A Station ..	57 53 0	57 53 0	..	3·07460	1187·41
Right Base Stn.	Supplementary	121 19 52	9·93155		
B Station ..	0 47 8·2	0 47 8·2	2·86293		

Error per mile = 3 feet.



The two triangles give the common side A to B, with a discrepancy of a little under 3 feet per mile, and this *mean* value would probably furnish a reliable base for a trigonometrical survey of limited extent.

19. In the second of the two contingencies under which a surveyor might probably have to work, namely, when B station could *not*, from want of a mark thereat, be observed from A, it would be necessary to determine at A the true azimuthal directions of the short bases at that station, and then, arriving at B, he would take the angles as on para.

17, and in addition observe the azimuth of A from B, and in order to compute the triangles shown in para. 18, he will have to *deduce* the angles from the azimuths in the following manner:—First, make on some convenient scale a rough plot of the work so far as it has gone, and enter thereon all the data so far forthcoming. Then, in order to deduce the angles of the triangles on para. 18, he will assume, as near as he can, by estimation or otherwise, the difference of longitude between A and B in miles, and on this difference of longitude compute the convergency of the meridians of the two points, and enter the same with its proper sign on the rough plot. Then, by applying the reversed azimuth of A from B, \pm convergency, he will obtain the approximate azimuth of B from A; and now, having all the azimuths at A, he can for a first approximation compute the triangles. This will determine the difference of longitude far more nearly than the surveyor could look for by estimation, and in the case of the distance here instanced—about 15 miles—he should have been able to estimate it within, say, five miles, that is, he guessed B to be nine miles west of A, then, the convergency on that diff. long. in lat. 29° would be $-4' 20''$.

20. In the following table may be seen the observed and the deduced data:—

At A Station.					At B Station.				
Azimuths (from south.)					Azimuths.				Convergency.
									' "
Left base station	..	..	..	0 0 50	Left base station	..	264 36 45		
B station	..	..	..	85 9 41	A station	..	265 14 1	4 20	
Right base station	..	..	..	143 2 50	Right base station		266 1 9.2		

First approximation. Convergency assumed $-4' 20''$.

Base, chains 12.91.			Log.		1.11091		
Left Base Stn.	Supplementary		94	13	53	9.99881	3.07468
A Station	..	85 8 51	..	..	..	..	1187.62
B Station	..	0 37 16	..	..	2.96496	..	M 14.85
		85 46 7					
Base			Log.		1.28012		
A Station	..	57 53 9					
Right Base Stn.	Supplementary		121	19	43	9.93156	3.07461
B Station	..	0 47 8.2	..	..	2.86293	..	1187.43
		58 40 17					M 14.84

Second (final) Approximation Convergency (*computed*) — 7' 6"

Base, chains, 12·91			Log.		1·11091.
Left Base Stn.		94 15 48	9·99879	3·07466	1187·57
A Station ..	85 6 56				
B Station ..	0 37 16		2·96496		
	85 44 12				
Base, chains, 19·06			Log.		1·28012.
A Station ..	57 56 50				
Right Base Stn.	..	121 16 2	9·93184	3·07489	1188·20
B Station ..	0 47 8·2		2·86293		
	58 43 55				

Showing a difference between the common sides of 63 links = 41 feet, or less than three feet a mile.

21. The simplest way of determining the azimuths required in this process would be by observations to the sun, or to the Pole star during daylight. This star may readily be found by means of a simple star-finder, used by myself for the past twenty years, and is visible with a 12-inch theodolite throughout the day. For two hours after sunrise, and before sunset, it may be seen with a seven-inch, and half an hour before and after with a six-inch theodolite.

22. Though this application of the Bar-Subtense method to a more extended class of operation has never been used in actual survey, yet it has been carried out by myself experimentally, to a sufficient extent to prove its trustworthiness as a basis for topographical survey and for geographical explorations of fairly extensive limits. In the Himalayan districts of Kulu and Kangra I was able to repeat the triangulation of the Grand Trigonometrical Survey, with an error quite inappreciable, on the scale of one mile = one inch. By fixing two "short bases" on the conspicuous Asapuri range in Kangra, I had a ready means of fixing my position, with a close approximation to the truth, within an area of many hundred square miles to the north and south of that range, and up to a limit of some 20 or 25 miles could obtain a base for further extension, with an expedition quite impossible by any other means I am acquainted with, and with an accuracy only surpassable by a regular trigonometrical survey extended from an elaborately measured base.

23. With respect to the Bar-Subtense regular traverse system, I may say that hundreds of such traverses, based on trigonometrical points in the Himalayas, have been tested, showing the error of the same to be

within three feet per mile. That is to say, a country which from its physical difficulties would ordinarily be closed to any kind of chain measurements, may be freely measured by this process with an accuracy only obtainable on level ground by a careful and well trained squad. By properly mounting the humble two-foot Gunter's scale, you may obtain "short bases" capable of yielding trigonometrical work that will not be far from the truth, and which, for moderately large areas will be quite sufficiently rigorous to form a basis for ordinary topographical purposes.

24. In conclusion, I would beg of any surveyor who has been brought up in the belief that triangles should nearly approach the equiangular, to pause ere he condemns this, my process, which I and others have tried, in which the triangles, when plotted on paper, appear from the shortness of their bases as straight lines when, instead of finding the angles to be within a few degrees of 60° he finds one of them to slightly exceed four minutes.

25. I regret that I have been unable to obtain the requisite instruments by which I might have given a practical illustration, but failing this, I shall be happy to explain my system to any one who may wish to be further enlightened on it. For railway surveys in mountainous tracts, and for coast and riverain surveys, it is invaluable, and has only to be once fairly tried to become a favourite method with the intelligent surveyor; but, except in India, it is not known, and I shall therefore be glad if the short description given of it here may cause it to be taken up in other parts of the globe—in such localities where the physical obstacles are such as to preclude any other simple and accurate method.

GEOGRAPHICAL NOTES.

Exploration in the Karakorum.—In the course of last session the Council, after examining the proposals of Mr. W. M. Conway for a journey of exploration among the high peaks and glaciers of the Karakorum range, to be undertaken by a party trained in Alpine mountaineering, and competent to undertake survey work and make scientific observations, agreed to offer Mr. Conway, under certain conditions, a grant in aid of such an expedition. During the past summer the projected plan has taken further shape, and the basis of the party has been constituted by the association as a leader with Mr. Conway of the Hon. C. G. Bruce, of the 5th Goorkhas, a son of our former President, Lord Aberdare. Mr. Bruce's large experience of Himalayan travel should be of great service, and he is also a practical mountaineer. Mr. Conway himself is well known both in the literary world and in the Alps as a writer and a climber, and has in his Pennine

Guide-books shown himself a careful topographer. He hopes to be able by means of photography to secure a representation of the peaks and glaciers and to carry further Colonel Godwin Austen's maps of their recesses, and to solve as far as may be possible in one season the question of what is the greatest height mountaineers of our generation can attain. Mr. Conway has in contemplation to add to his party at least one Alpine guide, and will also be accompanied by Mr. Eckenstein, a climber resident in London, who is practically acquainted with the methods of the Swiss Survey.

Mont Blanc and Glacier Oscillations.—Those who have read the accounts of the early ascents, and even of some of the more recent ascents of Mont Blanc, will understand the limitation introduced by the words "of our generation" in the preceding note. A hundred years ago the natives of the valley of Chamonix who took travellers up the mountain suffered as much as their employers from physical sensations ascribed, no doubt rightly, to the rarity of the air. They were unable to walk more than a few paces without halting. Last autumn, travellers who walked in early morning from the hut under the Bosses (14,000 feet) to the top (15,780 feet) had the company of five Chamoniards. They went up at a fair pace without resting. Arrived on the top, without a moment's pause, the men took their spades and shovels and began digging. They asserted that they did only about a third less work in the day than in the valley; and that they suffered no inconvenience from a prolonged stay in the Bosses hut; slept well, and ate largely. Their work was to excavate a tunnel in the summit ridge about 30 feet below the top. The object of this tunnel was to reach rock, in which a shelter-cave might be excavated. No rock had been found up to September 11th. The whole summit-ridge seemed to consist of compact opaque snow of exquisite purity. The rocks, a short distance from the top *on the Italian side*, were not considered available by the Frenchmen who were desirous of erecting the shelter. It was proposed, as no rock had been reached under the top, to carry there a wooden framework, in shape and size not unlike a bathing machine, and fix it in the mouth of the gallery, in the hope that it might be dug out next summer and serve as a refuge for such scientific observers as might not be satisfied with the commodious hut near the Bosses.—The newspapers have recorded the fatal accident caused by an ice-avalanche from the shoulder of the Dôme du Gôûter sweeping across the track followed on the Petit Plateau. It is to be feared the recent increase of the Alpine glaciers, more conspicuous, perhaps, in those of Mont Blanc than elsewhere, may lead to further accidents of the same kind. As the ice-bosses on the mountain side swell and the small glaciers push on, séracs and stones are liable to fall across the ordinary track, both near the Pierre à l'Échelle and at the scene of the recent accident. It is possible the route now followed may have to be modified in consequence.—In connection with the oscillations

of Alpine ice, writers and readers may be warned not to be led, as some have already been, to imagine that the discovery of a horse's skull and Roman coins on the St. Theodul Pass is any kind of proof that that pass was once free from ice. It is interesting evidence that the pass was frequently crossed by men and horses in Roman times, as we know it was in medieval times; but it is nothing more. Before good roads are made, or where good roads cannot be made, across a chain, glacier passes are not uncommonly used as highways. On the Nakhra Pass, between Suanetia and the Baksan—a Caucasian St. Theodul—horses are lost nearly every year. A Sotnia of Cossacks has been sent over it, and the discovery of a handful of copecks there eighteen hundred years hence will prove nothing as to glacier movements.

The Natural Limits of Europe.—In the new issue of the 'Bevölkerung der Erde,' Drs. Wagner and Supan give estimates of the various areas which may be allotted to Europe, according to the natural boundaries which are adopted. The Canaries, Madeira, the Azores, and the islands in the Sea of Marmora they hold to be outside the natural limits of Europe. According to the limits adopted as separating Europe from Asia, the area varies as much as 424,730 square miles. (1) Europe in the narrowest physical sense, with the crest of the Urals and the line of the Manych river as the eastern boundary, has an area of 3,570,030 square miles. If to this we add the Polar islands, Iceland, Nova Zembla, and Spitzbergen, we get 3,672,994 square miles. (2) Europe to the crest of the Urals, the Ural river, and the line of the Manych, gives an area of 3,687,790 square miles; with the Polar islands, 3,790,754 square miles. (3) Europe to the crest of the Ural, the Ural river, and the crest of the Caucasus gives 3,790,505 square miles; with the Polar islands, 3,893,469 square miles. (4) Europe within the widest limits, including the Urals and the Caucasus, and the Caspian Steppes to Emba, embraces 3,988,620 square miles; with the Polar islands, 4,091,582 square miles. Europe within administrative boundaries covers an area of 3,836,910 square miles.

Indian Frontier Expeditions.—It is in contemplation to despatch an exploring expedition under Lieutenant Colomb, during the cold season, from the Assam valley across the Patkoi range, into the upper basin of the Irawadi, a region, which it may be remembered, was partially explored by Colonel Woodthorpe and Mr. Ogle in 1884-85, and by Mr. J. F. Needham and Mr. Ogle in 1888. On reaching the main stream of the Irawadi, the party will follow the course of the river southward to Bhamo, thus traversing much of the hilly country inhabited by Kachyens and other independent tribes. The expedition will be accompanied by Dr. Prain of the Royal Botanical Gardens, Calcutta, and Mr. A. Gray, engineer, of the Doom-Dooma tea company, Lakhimpur, and escorted by sixty sepoy, probably of the 42nd Goorkha Rifles. It is

expected that further light will be shed on the question of the best means of communication by road and rail between Assam and Upper Burma, and the still vexed question of the source of the Irawadi. In the most recent map of Burma and adjacent countries, issued in March last year by the Surveyor-General of India, the great Salwin river is represented as rising about 28° N., i. e. just about the same latitude as Sadiya, while the eastern head stream of the Irawadi (the Meikha) is traced as coming from the Tibetan plateau several hundred miles further north. This change in the hitherto accepted geography of further India will show that there are still some interesting geographical questions for the forthcoming expedition to solve, without its having to go very far afield. Later information renders it probable, however, that the escort will be dispensed with, as the tribes on the line of route are believed to be quite friendly.—Another expedition, but on a smaller scale, is to advance into the Abor Hills north-west of Sadiya, with the object of pacifying some of the frontier clans. This mission will have a good opportunity of acquiring some definite information regarding the lower part of the Sanpo river, a problem that was left in great uncertainty by the explorations of the Indian surveyor, Kinthup, who claimed to have followed the course of the river to where it bursts through the Himalayan chain.—Another explorer, Lieutenant Otto Ehlers, intends, in December next, to traverse the Shan States and penetrate into Siam, and will doubtless be able to collect important data regarding the real extent of Siamese jurisdiction, a point that the recent Anglo-Siamese Boundary Commission have been endeavouring to define. Lieutenant Ehlers has had much difficulty in the matter of transport arrangements, and has, therefore, had to postpone his departure till December. He will spend the next few months in the Nilgiris and Ceylon.

Mr. Joseph Thomson.—After an absence of eighteen months, Mr. Joseph Thomson has arrived in England from the expedition towards Lake Bangweolo which he undertook on behalf of the British South Africa Company, and on which he was accompanied by Mr. Grant, son of Colonel Grant. Among other contributions to geography, Mr. Thomson has made some interesting observations on the situation, extent, and character of Lake Bangweolo. Unfortunately he has somewhat suffered from the trials of his journey, but will doubtless recover his health and strength after a few weeks' rest and attention. Mr. Thomson has promised to read a paper on his expedition at one of the first meetings of the Society in 1892.

Additions to the British Protectorate of Lagos.—Mr. G. C. Denton, the acting Governor of Lagos, in a visit recently made to the north-west of Lagos, has made treaties with the chiefs of Addo, Igbessa, and Ilaro, whereby these countries become portions of the British Protectorate. These districts form the western boundary of Yoruba, and the

effect of their annexation will be to deter the Dahomians from making the periodical slave raids, which have for many years not only brought much misery on the inhabitants of the territories immediately behind Lagos but have also greatly injured the commerce of the colony. In each case protection was granted at the request of the countries concerned.

Signor Robecchi's Journey through Somali-land in 1891.—Dr. Bonola Bey, Secretary of the Société Khédiviale de Géographie, sends us an account of a remarkable journey across Somali-land from Magadoxo to Berbera, by Signor L. B. Robecchi, of which the following is a summary:—In starting from Magadoxo last February Signor Robecchi began with an inland excursion across the river Webi, which here approaches the coast to within 25 miles. He had soon a foretaste of what he must expect at the hands of the natives, being continually harassed on the march and even attacked. A severe encounter took place at Warsheik, 40 miles from Magadoxo, where he again touched the coast. From Warsheik he proceeded to el Athaleh, where he had himself previously founded an Italian station. This place, about 50 miles north-west of Warsheik, was the starting-point of a long inland excursion, undertaken for the purpose of "seeing and studying the river Durdur, marked on the maps." But, he adds, "I sought it in vain, for the Durdur does not exist." Till an accurate description of the route followed is published, it will not be possible to determine whether Signor Robecchi went far enough inland to find the Durdur, and whether the "microscopic salt lakes" he discovered do not correspond to the Doara, a wady into which (according to Habenicht's map) the Durdur flows at a distance of about 100 miles from the coast. Hopia, situated on the coast and under 6° N., was reached about the end of May. After some trouble with the local sultan, Jusuf Ali, and vexatious delay in getting an escort, he started for the interior about the middle of June, with 30 men and 15 camels, proceeding in a north-westerly direction as far as the Oasis of Mudug, 120 miles from Hopia. Turning to the south-west he traversed the territory of the Marehan and Hawijeh tribes, and reached the Webi Shebeli river under about 4½° N. Advancing up the fertile and well-cultivated valley of this river he reached Barri, the most southerly point visited by James and Aylmer in 1885. From here he intended to march direct on Harar, but reports of fighting among the Amaden and Karanle to the north-west caused him to turn northwards, and he reached Faf "by a new route" east of that followed by James and Aylmer. He now determined on a second attempt to reach Harar, and ascending the valley of the Tug Faf, actually got to Heen (a name we do not find on Habenicht's map), within three or four day's journey of it, but was again obliged to change his plans, owing to the unsettled condition of the country. Heen is the chief religious centre of the Somali tribes. Turning east-

wards he reached Milmil, and thence proceeded northwards to the coast, arriving at Berbera in August. The total distance traversed in the six months was about 1800 miles. It is to be hoped we shall soon have a more detailed account of this adventurous journey through regions for the most part unknown. We may expect geographical and specially ethnographical results of considerable importance.

Return of M. Fourneau's Shari Expedition.—The expedition led by M. A. Fourneau into the unknown region between the Sangha and the Cameroons, has returned to the Congo, without accomplishing its object, which was to penetrate northwards to the Shari by a route parallel to that followed by the unfortunate expedition of M. Crampel. M. Fourneau left the French military station of Uassu on the Sangha on the 7th March, and after following the N'goko or right arm of the Sangha for some distance, crossed over to the basin of the other branch of the river, the Masa, and on the 9th April met the little steamer *Ballay* which had navigated the Masa under the guidance of Captain Husson and M. Gaillard. Proceeding up stream the party arrived on the 18th April at a point where the Massieba or Massipa from the west and the Likelle from the north, unite to form the Masa. M. Fourneau continued the march to the north. On the 1st May, however, after crossing a stream, he was attacked by the natives, and again on the 11th May, when he suffered such losses in men and baggage that he was compelled to beat a hasty retreat to Uassu. The basin of the Sangha extends up to 7° N. lat.

Father Schynse's Survey of the South-west shore of Victoria Nyanza.—In the beginning of the present year, Father Schynse made a journey from his station of Bukumbi, situated in a bay on the south shore of the Victoria Nyanza, round the south-west corner of the lake, and along the west coast, to near the capital of Uganda. According to the letters in a recent number of 'Petermann's Mittheilungen,' he started on January 29th. He passed round the large bay discovered by Mr. Stanley, and which he found extended to 2° 51' S. lat. Between this bay and that of Bukumbi extends a small bay, Ngulula, extending to 2° 47' S. lat. The bay discovered by Mr. Stanley is known as Bukuma. It is shallow, and its waters seem to be retiring from its southern shore. From the Bay of Bukuma, Father Schynse marched northwards to Emin Pasha's station of Bukoba, situated under 1° 20' S. lat., and then on across the Kagera, the boundary between the English and German spheres of influence, to Buyaga, whence he intended to strike across to Karagwe and Usuwu, but the rains compelled him to retrace his steps to Bukoba and Bukumbi. The south-western shores of Nyanza are inhabited by the Basinja, called also Wanamueri, who extend as far as 2° 10' S. lat. The country between this point and Uganda is peopled by the Baziba. The Basinja are a mixture of the indigenous Wanyamwesi with the Baima (Watusi) who came from the north. Formerly they were united in the

one kingdom of Usinja, but they are now split up into a number of tribes. Their country is flat, and intersected by granite ridges. Ngulula contains more important hills, the Lutende (2000 feet) and the Sangu-rurua. The Baziba country is hilly, with level valleys running parallel to the lake. These valleys, mostly marshy, are uninhabited, but the hills are thickly populated. The hilly country ceases at the Kagera. In the vicinity of the latter river there is virgin forest, but the rest of the Baziba country has been completely cleared of trees, and is now covered with a growth of high grass, forming a fine meadow land. The country round Bukoba is fertile and well populated; the people rear fine horned cattle, and live principally on bananas. The traveller met with a friendly reception from the Baziba, but came into conflict with some of the Wanamueri. Father Schynse's observations on this journey will add considerably to the cartography of the region he passed through.

Mr. F. S. Arnot's Progress in West Central Africa.—Mr. Arnot, writing from Bihé on the 6th August last, informs us that his long detention at that place on his journey from Benguella to Garenganze is coming to an end. His caravan was nearly complete, and he hoped in a few days to cross the Quanza river, on his easterly route. He will be accompanied by Mr. H. B. Thomson and a party of five missionaries and four coloured handicraftsmen from Jamaica. Three of these would probably remain on the way in the interesting country of the Cuvale, in which case Mr. Arnot would stay with them for two months, Mr. Thomson going on to Garenganze, taking with him the present which the Royal Geographical Society had entrusted to Mr. Arnot in 1889, for delivery to Chitambo, the chief of the Ilala country, who behaved so well in connection with the removal of Livingstone's body and personal belongings. The present will be delivered to Chitambo at the earliest possible opportunity, either by Mr. Thomson or Mr. Swan.

The Danish Expedition to East Greenland.—The first news that has reached Europe concerning the new Danish expedition to East Greenland is dated June 29th. At that date the *Hekla* was in 71° N. lat., near Jan Mayen, and far from the east coast of Greenland. The condition of the ice this summer has rendered the navigation of the Arctic Seas extremely difficult. The pack extended far to the south, and surrounded Jan Mayen with a circular barrier. The east coast of Greenland was unapproachable, and the *Hekla* was anchored for the time in a bay of the pack. Still Captain Knutsen intended to make for the Greenland coast between 73° and 76° N. lat., the ice, according to the seal-hunters, appearing to be less dense in that quarter.

Tasman Sea.—The Lords of the Admiralty, in compliance with a resolution of the Australasian Association for the Advancement of Science, have decided to give the name of Tasman Sea to that part of the ocean

between the Australian Continent and Tasmania on the one side and New Zealand and the islands on its north-west on the other.

The Population of the Earth.—After an interval of nine years, a new edition of the 'Bevölkerung der Erde' has been issued, under the care of Professor Hermann Wagner and Dr. Supan. The following table exhibits the general results as to the areas and populations of the great divisions adopted by the editors:—

	Square Miles.	Population.	Population per Square Mile.
Europe (without Iceland, Nova Zembla, and the Atlantic islands)	3,756,850	357,379,000	92
Asia (without the Polar islands)	17,044,182	825,954,000	48
Africa (without Madagascar, &c.)	11,277,325	163,953,000	14
America (without the Polar islands)	14,801,400	121,713,000	8
Australia (Mainland and Tasmania)	2,971,440	3,230,000	1
Oceanic islands	733,120	7,420,000	10
Polar regions	1,730,830	80,400	—
Totals	52,315,147	1,479,729,400	28

This shows an increase of 45 millions over 1882, the difference, however, being due not entirely to actual changes in the population, but to more accurate data having become available. It will be noticed that Drs. Wagner and Supan credit Africa with a population greater by 40 millions than that allowed by Mr. Ravenstein. The fact is, the data for Asia and Africa are so uncertain that there may be an error (plus or minus) in Wagner and Supan's estimate of from 50 to 100 millions.

A New Geographical Periodical.—Under the title of "Annales de Géographie," MM. Armand Colin et Cie., of Paris, have issued the first number of a new periodical devoted to geography. It will appear quarterly under the editorship of M. Vidal de la Blache and M. Marcel Dubois. The new journal is not intended as a mere chronicle; its aim will be to review systematically the progress of geography in all its amplitude and all its aspects. It will consist of three main sections: (1) the discussion of great geographical questions; (2) critical *comptes rendus* and bibliographies by specialists in each department; (3) correspondence, studies of special regions, information, &c. The first number, among other things, contains articles on "France beyond the Seas" by M. P. Foncin; "France and the Routes to the Soudan," by M. H. Schouwer; "Recent Geographical Work in France," by M. Vidal de la Blache. These are followed by articles on the "Geography of Europe in recent years"; "The Geography of Africa in 1880 and 1890"; "America"; "Oceanography and Oceania"; and a variety

of other special articles. The review covers 120 pages, and sells for four francs per number.

Geography at Cambridge.—Mr. J. Y. Buchanan, University Lecturer in Geography at Cambridge, will lecture during the present term on Physical and Chemical Geography, with special reference to land surfaces and their development under climatic and other agencies. The course began on Tuesday, October 20th.

NEW GEOGRAPHICAL PUBLICATIONS.

(By J. SCOTT KELTIE, *Librarian R.G.S.*)

EUROPE.

[Switzerland.]—*La Correction des Torrents en Suisse. Exposé Raisonné d'Ouvrages Exécutés. Rédigé par ordre du Département Fédéral de l'Intérieur par A. De Salis, Inspecteur Fédéral en Chef des Travaux Publics. 1ère Livraison. Berne, 1891: 4to., pp. 61; 31 plates. [Presented by the Swiss Department of Public Works.]*

The Swiss high lands are sometimes visited by the scourge of landslips due to the filtration of subterranean waters, but the surface-streams are slowly working changes not less disastrous. They set in motion disintegrated boulders of large size, which in their fall carry large volumes of sand and shingle down into the valleys. Professor Calmann, of the Zurich Polytechnic, was from 1858 to 1863 entrusted with an exhaustive investigation of the possible means of correcting these evils. The result was a Federal decree in 1877, authorising certain works for the regulation of streams. M. Ad. De Salis, the Federal Inspector of Public Works, has come to the conclusion that the building of weirs and cross dykes is the best means of moderating the strength and erosive power of the highest streams. "Des barrages," he says, "et encore des barrages." These have been distributed liberally along impetuous streams of rapid slope, built of strong material and on a massive scale. As an example of his mode of work, M. De Salis gives in the above memoir a detailed description of two of these corrected streams, with numerous plans and maps, and a very fine collection of admirably-taken photographs. One of these, the Kleine Schliere, formerly spent the fury of the waters of the south slope of Mount Pilatus on the plain and town of Alpnach, and threatened to choke the course of the Aa, the outflow of Lake Sarnen. No less than sixty-three weirs have been built across one of the tributary streams of the Schliere, on a slope of about 1800 feet; thirty-three more on other reaches of the main Schliere, whose subdued waters are now diverted from the Aa to the shallow lake of Alpnach, with no danger of silting up, as they reach the lake so limpid that they no longer deposit the sand and gravel which used to be spread over the roads. Some ten square miles of land have thus been rescued, at a cost of 8490*l*. No attempts at forest-planting are made until the works are well consolidated. One hundred and nineteen streams have so far been corrected in Switzerland, at an outlay of 361,240*l*. Thus the natural geography of this interesting country is being changed, to the advantage of humanity, by the hand of the engineer. At the two ends of the Rhine two small nations are struggling for existence against dangers of a very different character, arising from the action of those forces which mould the physical features of the earth: the Swiss by regulating the tear and wear of the streams in the Sturm and Drang period of their youth, the Dutch in resisting the formidable siege of the ocean.

ASIA.

D'Orleans, Prince Henri.—De Paris au Tonkin par terre. Pp. 56, with a map. Reprinted from 'La Revue des deux Mondes.'

This is a popular and unpretentious narrative of a remarkable journey performed by the author in company with M. Bonvalot and Father Dédékens, a Belgian missionary, across the least known parts of Central Asia and Tibet. As far as Lake Lob their experiences were of no unusual character, the route followed from Kulja to Lob-nor having been traced by Prejevalsky. But to the south of this oasis lay a most difficult region, where every European expedition in modern times had been obliged to retrace its steps. Warned by the experiences of their predecessors, all precautions were taken. Of bread alone 2000 lb. were baked, a supply sufficient to last their party for six months. The awful hardships and privations which had, nevertheless, to be endured are graphically described in these pages, hardships and difficulties costing the lives of two of their native followers, and only overcome by the most resolute perseverance. After advancing for two months across the glacier-covered chains of mountains covering this part of Tibet without meeting with a single human being, they were at length rewarded by gaining the inhabited region immediately north of Lhassa. Here, however, the obstinacy and suspicions of the Lamas were not to be overcome at any price. After three weeks of vain negotiations Prince Henry and his companions, though treated with great ceremony and politeness, were obliged to turn off the direct route to Lhassa, and taking a south-easterly direction to make their way to Batang, whence they finally reached Tonkin, having succeeded in tracing an itinerary between Russian and French possessions in Asia. It need hardly be said that the style and language of this narrative are in the best taste, worthy of the subject and the illustrious title borne by its author.—[E. D. M.]

Foreman, John.—The Philippine Islands. A Historical, Geographical, Ethnographical, Social, and Commercial Sketch of the Philippine Archipelago and its Political Dependencies. London, Low & Co., 1890: 8vo., pp. xiii. and 495. Price 21s. [Presented by the Author.]

So scanty has been our literature of late years on the Philippine Islands that the present production is a very welcome contribution to our knowledge of the group. The information it contains is so varied that not only will the historian, the geographer, and the ethnologist find much that is useful, but to the general reader also the volume will be of interest.

The opening chapters are mainly historical, with the exception of chap. ii., which contains a general description of the archipelago and its volcanoes. Other chapters treat of such matters as the government and local administration, provincial government, fiscal reforms, the Philippine budget, army and land forces, naval forces, religious ideas, &c. Chap. x. and following chapters are of ethnographical interest, dealing in turn with the domesticated natives, their character and social condition, the indigenous tribes and races, such as the Aetas or Negritos, Gaddanes, Itavis, Igorrotes, &c., the southern tribes, &c. Chap. xiii. is descriptive of the Philippine dependencies—the Ladrone and Caroline Islands. Another chapter deals with the early history of commerce, trade statistics, navigation in the archipelago, manufactures, railways; followed by others treating of agriculture and mineral productions. The concluding chapters describe the author's first tours in Luzon Island, and in the south, followed by some useful travelling notes, and an itinerary.

A map and an index add to the value of the work, which, on the whole, gives a general idea of the past and present condition of affairs in the colony.

Report of the Eastern Asiatic Society. Vol. ii. [In Japanese.] Tokyo: 8vo., maps.

This volume contains—Relation of Russia with Corea; History of the Philippines; Geography of the Eastern Countries; Chinese of Hawaii; the Climate of Eastern Asia, by N. Kanata, &c.

Wegener, Georg.—Versuch einer Orographie des Kwen-lun. Marburg, 1891: 8vo., pp. 112, two maps. [Presented by the Author.]

This treatise, written as an inaugural dissertation on obtaining the degree of Doctor of Philosophy at the University of Marburg, is a carefully considered study of a great subject. Though the travels of modern explorers have done much to throw light on parts of the Kwen-lun, very confused ideas have hitherto prevailed concerning it. To remove these and reduce our knowledge of the greatest of mountain systems into order has been Dr. Wegener's object in this work. He divides his subject into four parts:—(1) West of the 82nd meridian; (2) between 82° and 106°; (3) east of the 106th meridian; and (4) the Kwen-lun considered as a whole. So comprehensive a subject requires the most orderly treatment, and this we find throughout the essay.

The structure of the various ranges is examined from three several aspects:—(a) horizontal, (b) vertical, and (c) geological. Under each of these heads we find a careful analysis of all existing materials, mere speculative theories being rejected as tending to complicate still further a subject already exceedingly intricate.

In part ii. Dr. Wegener examines the recorded observations of modern travellers in the region between long. 82° and 106° E. In the latter meridian Baron Fr. v. Richthofen observed a network of seven parallel chains, preserving the general direction of the main axis of the Kwen-lun, i.e. from south-east to north-west. Our author develops these several ranges east and west of explored areas, filling in *lacunæ* where there have been no observations at all, and presents us with a fairly complete picture of the whole system in his map.

The region east of the 106th meridian (part iii.) is altogether better known. Here the personal observations of Richthofen and his able review of earlier materials render independent treatment unnecessary. Dr. Wegener therefore confines himself to a brief summary of his master's work, adding a few details derived from later authorities, e.g. Loczy's geological investigations while accompanying Count Szechenyi's expedition.

The last ten pages (part iv.) are devoted to a sketch of the Kwen-lun viewed as a whole, i.e. between the 75th and 118th meridians and the 30th and 40th parallels. Within these limits the Kwen-lun has an extreme length of about 2500 miles, an extreme breadth of about 500 miles, and an area of about 270,000 English square miles, or about twice that of the German Empire. The leading characteristics of this gigantic tract of mountainous land are ably summarised in the work before us, and a few suggestive conclusions drawn with reference to its past geological history. Some biographical particulars of the author and the names of those professors and teachers under whom he has studied are given at the end.—[E. D. M.]

AFRICA.

Baumann, Dr. Oskar.—Usambara und seine Nachbargebiete. Mit Abbildungen, Plänen und 8 Originalkartenbeilagen. Berlin, Dietrich Reimer, 1891: 8vo., pp. viii. and 375. [Presented by the Author.]

The author, who has travelled through German East Africa in various directions, gives in this volume a description of the districts of Digo, Bondei, Usambara, Pare, Usegua, Unguu, and the widely extending steppes north of Usambara and south of the Pangani river. The coast of these parts of German East Africa extends from the British territory at the mouth of the Umba river to the mouth of the Pangani. It comprises several important trading places, such as Musa, Kwale, Tanga, Tongoni, and Pangani, and is generally well peopled by Swahili, Wassegeju, Arabs, &c., whilst the interior is but thinly inhabited by various Bantu and Nilotic tribes, who are engaged partly in agriculture and cattle-rearing, and partly in trade, hunting, or robbery. West of the flat coast commences a series of undulating plains, slowly rising towards the interior, which south of the Pangani reach inland to the Unguu Mountains, whilst north of that river the highlands of Usambara form the western termination of the plains. Usambara, which is one of the most important regions of the whole territory,

is described as consisting of plateaus and mountains rising to altitudes of about 6500 feet above sea-level. Still higher are some of the mountains of the Pare district, which reaches from Usambara to Mount Kilima-njaro. The Uмба Nyika north of Usambara and the extensive Masai Nyika between Usegua and the Pangani river are uninhabited steppes, visited only by nomadic Masai and Wakuafi tribes. The principal rivers—the Pangani, Zigi, and Uмба—are not of much importance for navigation and commerce, on account of cataracts, partial shallowness, and bars which block the mouths. Geologically, the coast consists of a recent coralline limestone formation. West of it a light-grey limestone is found, which is, doubtless, a continuation of the Jurassic limestones which appear near Mombasa. West and north of these rocks a formation of grey clay-slates has been discovered north of the Zigi river, whilst elsewhere in the interior the soil consists of the characteristic South African gneiss and crystalline schists, interrupted only by limestones near Kitivo, Muala, and Aruscha, and by the igneous rocks in the neighbourhood of the former great centre of volcanic action in this part of Africa, viz. the Kilima-njaro. Alluvial deposits are found only at the mouths of the rivers and in the valley of the Luengera.

As regards vegetation, this territory must be divided into different sections. Large areas, as already remarked, consist of steppes (Nyikas) with their peculiar flora, consisting of grass, acacias, isolated baobabs, &c. The latter, moreover, are frequently found in the fertile plains more to the east, which are covered with plantations and grass, and in the neighbourhood of the rivers with gallery forests. Ordinary forests are found in Eastern Usambara, especially in the districts of Handei, Kombola, and Hundu, and such tracts of land, when cultivated, become most fertile. Western Usambara consists of large, elevated grass-covered plains, suitable for cattle-rearing. The mountainous districts are especially favourable for the luxuriant tropical vegetation, but the fauna is best developed in the steppes, the plains round the Kilima-njaro abounding in wild animals.

The author gives many useful details about the various tribes which inhabit these territories. He tries to find the correct relations existing between the different representatives of the Nilotic group, viz. the Masai, Wakuafi, Ndorobbo, and Wambugu. The first Nuba nomads who immigrated into these countries were the Wakuafi; and the interesting Wambugu are probably descendants of some of them. The Wambugu, gradually giving up their nomadic life, first settled in the Pare Mountains, but afterwards emigrated to Usambara, where they are now living in scattered settlements among the Bantu population. The Wakuafi, after many hard fights, were obliged to give up their raids, &c., when, about fifty years ago, their relatives, the Masai, invaded and subjugated the country. It is, therefore, according to the author, incorrect to regard both as identical, although they are doubtless near relatives. The Wakuafi are now engaged in cattle-rearing in West Usegua, North Unguu, and near Masinde, Tarawanda, and Taveta. The Masai, the scourge of East Africa, wander as nomads and robbers through this whole territory, the Sogonoi Masai living north, and the Kibaia and Bukoi Masai south of the Pangani river. Somewhat dependent on the Masai are the Ndorobbo, who live in the steppes as hunters, and have some fixed settlements at the Pangani, Mkomasi, &c. Although they are of much smaller stature than the Masai, the author believes that they are Nubas, like the latter, whilst Dr. Cust thinks that they may be allied to the Bushmen and the Central African dwarfs. According to v. Höhnelt the language of this most interesting tribe is similar to that of the Kamassia. Various Bantu tribes inhabit these territories. West of the coast districts live the Wadigo, Wabondei, and at the Pangani, and south of it the Wasegua. The Usambara highlands are inhabited by the Waschambaa, and some districts by the Wambugu and Wapare, whilst the majority of the latter occupy the Pare Mountains more to the west. The best populated parts after the coast are Bondei, Digo, and northern Usegua, the districts further west being much more sparsely peopled, there being in some of them no permanent settlements at all, and the only inhabitants are Masai, &c. Dr. Baumann estimates the entire population to be not more than 156,000.

As regards the importance of this part of East Africa for commerce and

colonisation, nothing definite can be said at present. The coast town of Tanga is the most important place on account of its good harbour and the easy communication that exists with the interior. Preparations are now being made for the building of a railway from Tanga to Korogwe on the Pangani, by which the products of plantations, mission stations, &c., will be enabled to be easily transmitted to the coast.

Dr. Baumann's large map (scale 1:300,000) of Usambara and the surrounding districts, accompanying the volume, is one of the most important additions to the cartography of East Africa, and greatly helps in forming a correct idea of the present state of exploration of the German territory between Mount Kilima-njaro and the coast.—[H. S.]

Kan, C. M. [Prof. Dr.].—*De Periplous van Hanno*. Overgedrukt uit het Tijdschrift van het Koninklijk Nederlandsch Aardrijkskundig Genootschap, Jaargang 1891, 8vo., pp. 55. [Presented by the Author.]

This paper is an elaborate commentary on Hanno's journey along the west coast of Africa. The author has compared the Carthaginian report with the accounts which the other geographers of antiquity give of this part of Africa. He has fixed the positions of Hanno's principal localities, and has pointed out cases in which a coincidence with other writers of antiquity can be proved, or where Hanno's description is detailed and exact enough, to allow a comparison with our modern geography of West Africa. For this purpose the author enters critically into many detailed arguments, coming to the conclusion that the following places are respectively identical:—Thumiaterium and Mamora (Mehedia), the Lixus river and the Wadi Draa, the river Chretes and Segit-el-Hamra (opposite the Canary Islands), Hesperia Keras and a promontory at the mouth of the Rio Grande, the Theon Ochema and the Kakoelimah mountain (near the bay of Sangareah), Noti Keras and a promontory in the neighbourhood of the island of Sherboro. This careful and painstaking criticism of Hanno's report is a valuable addition to our knowledge of the ancient geography of Africa.—[H. S.]

Mathers, E. P.—*Zambesia, England's El Dorado in Africa; being a description of Matabeleland and Mashonaland and the less-known adjacent Territories, and an Account of the Gold Fields of British South Africa*. London, King, Sell, & Railton, [1891]: 8vo., pp. vii. and 480, maps, portraits, and illustrations. Price 7s. [Presented by the Author.]

This is mainly a collection of extracts from various sources, but is useful as giving a full description of the newly-acquired territories of the British South Africa Company to the north and south of the Zambezi.

Muller, Hendrick P. N.—*Zuid-Afrika*. Leiden, A. W. Sijthoff: 8vo., pp. viii. and 393. [Presented by the Author.]

The author gives a good and pleasantly written account of his wanderings and experiences in South Africa, describing the Transvaal, Delagoa Bay, Natal, the Diamond Fields, &c. We do not expect now-a-days to find fresh geographical information in a book which deals only in a general way with these parts of Africa, but such a characteristic description of country and people as that given by the author will always be welcomed by those who take an interest in the development of the countries of which the volume treats.

Widdicombe, John.—*Fourteen Years in Basutoland*. With four portraits and an illustration. London, The Church Printing Company, [1891]: 12mo., pp. viii. and 306. [Presented by the Publishers.]

An account of missionary experiences in Basutoland in connection with the Thlotse Mission. Some useful notes on the habits and customs of the people are given.

NEW MAPS.

(By J. COLES, *Map Curator*, R.G.S.)

EUROPE.

Espagne.—Carte des chemins de fer de l'— et du Portugal. Scale 1:2,400,000 or 32·9 geographical miles to an inch. Paris. (*Dulau*.)

España y Portugal é Islas Adyacentes.—Mapa Indicador de la División Militar de —. By D. Tomás Monteverde (Tent^o Cor^l de E. M.) and D. Ignacio Castañera (Cor^l Tent^o Cor^l de M. E.). Scale 1:1,000,000 or 13·6 geographical miles to an inch. 1889. Price 10s. (*Dulau*.)

Italy.—Dislocations-Karte der Italienischen Armee nebst tabellarischer Uebersicht der Ordre de bataille und der Armeeverhältnisse im Frieden und im Kriege. Bearbeitet von Eugen Schuler k. u. k. Hauptmann. Scale 1:1,500,000 or 20·4 geographical miles to an inch. Verlag von Artaria & Co. Wien, 1891. [Presented by the Publishers.]

The symbols, by means of which the disposition and composition of the Italian army is shown, are well chosen and clearly explained in the tables which accompany the map, from which also other information useful to military men may be gathered.

Oesterreichisch-Ungarischen Monarchie.—Spezialkarte der —. Scale 1:75,000 or 1 geographical mile to an inch. K. k. militär-geographisches Institut, Wien, 1891. Sheets:—Zone 20 Col. IV. Cles; 21—IV. Trient; 21—V. Borgo und Fiera di Primiero; 22—IV. Roveretto und Riva; 23—III. Lago di Garda; 23—IV. Avio und Valdagno. Price 1s. 4d. each sheet. (*Dulau*.)

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(*Stanford, Agent*.)

ASIA.

Palästina.—Neue Handkarte von —, im Massstabe von 1:700,000, or 9·5 geographical miles to an inch. Nebst Alphabetischem Namen-Verzeichnis und Quellen-Nachweis, bearbeitet von Dr. Hans Fischer und Prof. Lic. H. Guthe. Leipzig, Verlag der Geograph. Anstalt von H. Wagner & E. Debes, 1890. Price 2s. [Presented by the Publishers.]

In the letterpress which accompanies this map, the authors give a list of the authorities consulted in its compilation. The map is a very fine specimen of cartography, and every effort appears to have been made to render it as complete as possible. Insets on an enlarged scale are given of the highlands of Judea, the roads between Nazareth and Tiberias, and Jerusalem. The alphabetical index with which it is furnished contains the names of all the places that appear on the map, and will prove very useful for general reference.

The map is printed in colours, the lettering is remarkably clear, and for general use it has the further recommendation of being of a very handy size.

Schott, Dr. Gerhard.—Die Meeresströmungen und Temperaturverhältnisse in den Ostasiatischen Gewässern. Von Dr. Gerhard Schott. Tafel 1. Isothermen der Meeresfläche im Februar. Tafel 2. Isothermen der Meeresfläche im August. Tafel 3. Linien gleicher jährlicher Schwankung der Oberflächen-Temperatur des Meerwassers. Tafel 4. Jahresisothermen des Wassers der Meeresoberfläche. Petermann's 'Geographische Mitteilungen,' Jahrgang 1891, Tafel 15. Justus Perthes, Gotha. [Presented by the Publishers.]

AFRICA.

Afrika.—Physikalische Wandkarte von —, von Heinrich Kiepert. Scale 1:8,000,000 or 109 geographical miles to an inch. Auflage Neubearbeitung von Richd. Kiepert. Berlin, D. Reimer. 6 sheets. Price 8s. (*Dulau.*)

Gallaländern.—Dr. Anton Steckers Reise in den —. Konstruirt und gezeichnet von G. E. Fritzsche. Scale 1:1,000,000 or 13·6 geographical miles to an inch. Petermann's 'Geographische Mitteilungen,' Jahrgang 1891, Tafel 17. Gotha, Justus Perthes. [Presented by the Publishers.]

Guinée portugaise et possessions françaises voisines, d'après la carte dressée par la commission française de délimitation corrigée et complée d'après de nouveaux travaux exécutés en 1890 et 1891, par le capitaine Brosselard-Faidherbe. Scale 1:1,000,000 or 13·6 geographical miles to an inch. Paris, Imprimerie Lemercier et C^{ie}. (*Dulau.*)

Victoria-Nyansa.—Das Süd-West-Ufer des —. Nach eigenen Routen-Aufnahmen u. Positionsbestimmungen gezeichnet von Pater Schynse. Scale 1:1,250,000 or 3·4 geographical miles to an inch. Petermann's 'Geographische Mitteilungen,' Jahrgang 1891, Tafel 16. Gotha, Justus Perthes. [Presented by the Publishers.]

AMERICA AND WEST INDIES.

Argentina.—Mapa de la República —, construido sobre los datos existentes y sus propias observaciones hechas en los años 1875 hasta 1888, por el Dr. D. Luis Brackebusch. Scale 1:1,100,000 or 15 geographical miles to an inch. Instituto Geográfico de C. Hellfarth, Gotha. 13 sheets. Price 3*l.* (*Dulau.*)

This is in reality two complete maps, one of the northern part, in nine sheets, and that of the south in four. In the compilation the author has largely used the results of his own observations made between the years 1875–88, in addition to which all reliable existing material has been utilised. The scale on which the map is drawn is sufficiently large to admit of a considerable amount of detail being given, it is printed in colours, and a complete explanation of the symbols employed is given.

Brazil.—Mapa Geral dos Estados Unidos do —, por J. Coelho e edicta pela Livraria Allemã de Ernst Nolte. Buenos Aires, 1891. Scale 1:500,000 or 6·8 geographical miles to an inch. 2 sheets. Price 17s. (*Dulau.*)

Chile.—Mapa de la república de —, por C. Opitz i Dr. H. Palakowsky. Scale 1:2,500,000 or 34·5 geographical miles to an inch. Edicion corregido 1891. Santiago. 2 sheets. Price 15s. (*Dulau.*)

Cuba.—Mapa Particular de la Isla de —, por D. Manuel Peñuelas y Vazquez. Habana. 2 sheets. Price 15s. (*Dulau.*)

Peru.—Mapa del —, par A. Raimondi. Scale 1:500,000 or 6·8 geographical miles to an inch. Gravé par Erhard, Paris. Sheets 10, 11, 12, and 13. (*Dulau.*)

CHARTS.

Admiralty.—Charts and Plans published by the Hydrographic Department, Admiralty, during July and August 1891. [Presented by the Admiralty through the Hydrographer.]

No.		Inches.	
973	m =	34·7	England, south coast:—Entrance to St. Germans or Lynher river, 2s.
1479	d =	2·4	Norway, west coast:—The Naze to the North cape, 2s. 6d.
1614	m =	6·0	Falkland islands:—Stanley harbour, 1s. 6d.
311	m =	7·0	Nova Scotia:—Halifax harbour, 2s. 6d.
549	m =	2·54	Brazil:—Port Camamu, 1s. 6d.
149	m =	0·53	Africa, west coast:—Old Calabar river, 1s. 6d.
1849	m =	12·0	Africa, south coast:—Simon's bay, 2s.
825	m =	0·13	Bay of Bengal:—Andaman islands (plan Table bay or Marshall channel) 2s. 6d.
1622	{ m = m = m =	{ 3·3 3·2 4·0	Philippine islands:—Katbalogan, Buri and Darajuai anchorages. Mauban bay. Port Libás, 2s.
1754	m =	0·24	China, east coast:—Tung Yung to Wen Chau bay, 2s. 6d.
1257	m =	0·45	Korea, west coast:—Ping Yang inlet and approaches, with the Tai tong kang and Kel tong kang, 2s. 6d.
2412	d =	2·8	China and Japan:—Amoy to Nagasaki, including the Yang-tse Kiang and the islands between Formosa and Japan, 2s. 6d.
1350	m =	15·0	Australia, east coast:—Cook harbour, 1s.
2423	m =	0·25	New Guinea, south coast:—Boigu island to Cape Blackwood, including Fly river, 2s. 6d.
1094	m =	2·5	New Zealand, North Island:—Mahurangi harbour and approaches, 1s.
1353	.. ..	.. ..	Malacca strait:—Plan added. Deli river.
651	.. ..	.. ..	Japan:—Plans added, Port Komane, Saga no Seki.

(*J. D. Potter, Agent.*)

CHARTS CANCELLED.

No.		Cancelled by	No.
549	Port Camamu	New plan, Port Camamu	549
149	Old Calabar river	New plan, Old Calabar river	149
1849	Simon's bay	New plan, Simon's bay	1849
825	Andaman islands	New chart, Andaman islands	825

No.		Cancelled by	No.
1754	Ragged point to Wen Chau bay	{ New chart, Tung Yung to Wen Chau bay	1754
1257	Ping Yang inlet	{ New chart, Ping Yang inlet and approaches.. .. .	1257
2412	The islands between Formosa and Japan	{ New chart, Amoy to Nagasaki ..	2412
1072	Endeavour river	New plan, Cook harbour	1350
2423	Bampton island to Aird river ..	{ New chart, Boigu island to Cape Blackwood.. .. .	2423
1094	Maurhangi harbour	New plan, Mahurangi harbour ..	1094

CHARTS THAT HAVE RECEIVED IMPORTANT CORRECTIONS.

No. 2175, England, south coast:—Poole harbour. 1170b, England, west coast:—Holyhead to Liverpool, eastern sheet. 1951, England, west coast:—Liverpool bay. 2800, Ireland:—Lough Carlingford, with Newry river. 1434, Mediterranean, Adriatic:—Gulf of Trieste. 302, Newfoundland, south coast:—Couteau bay to Cape Anguille. 259b, River St. Lawrence:—Ogden island to Kingston. 1152, Canada:—Lake Ontario, and back communication with Lake Huron. 2544, South America, east coast:—Rio de la Plata. 608, Africa, west coast:—River Gambia entrance. 1357, Africa, west coast:—Cape Formosa to Fernando Po. 758, Madagascar:—Northern portion. 1256, China, north-east coast:—Pe-chili and Liau-tung gulfs. 475, Australia, north-west coast:—Coast between the parallels of 10° 8' and 21° S. with off-lying islands and reefs, New Zealand:—Cook strait anchorages, sheet 1. 2685, New Zealand:—Cook strait anchorages, sheet 2.

(J. D. Potter, Agent.)

French Charts.—No. 4587, Atterrages de l'Entrée de la Manche et de la Côte Nord-Ouest de France, 1891.—4610, Bordeaux, 1891.—4457, Baie de Figari, Corse, 1890.—4546, Mouillage de Libreville et ses Environs. Gabon, Côte Ouest d'Afrique, 1891.—4462, Du Cap St. Sébastien à la Rivière Sahinana. Côte N.O. de Madagascar, 1890.—4451, Du Cap Voailava au Cap St. Sébastien, Côte N.O. de Madagascar, 1890.—4560, Mouillage du Bras de Snook (Partie Nord de la Baie Notre-Dame) Côte Est de Terre-Neuve, 1891.—4519, Guadeloupe. Ports et Mouillages, 1890. Service hydrographique de la Marine. Paris. [Presented by the Service hydrographique de la Marine.]

North Atlantic Ocean.—Pilot Charts of the ——. September and October, 1891. Published monthly at the Hydrographic Office, Navy Department, Washington, D.C. [Presented by the U. S. Hydrographic Office.]

ATLASES.

Berghaus' Physikalischer Atlas. (Begründet 1836 von Heinrich Berghaus.) 75 Karten in sieben Abteilungen, enthaltend mehrere Hundert Darstellungen über Geologie, Hydrographie, Meteorologie, Erdmagnetismus, Pflanzenverbreitung, Tierverbreitung und Völkerkunde. Vollständig neu bearbeitet und mit Mitwirkung von Dr. Oscar Drude, Dr. Georg Gerland, Dr. Julius Hann, Dr. G. Hartlaub, Dr. W. Marshall, Dr. Georg Neumayer, und Dr. Karl v. Zittel. Herausgegeben von Prof. Dr. Hermann Berghaus. Dreiundzwanzigste Lieferung. Inhalt: Nr. 18, Stehende Gewässer. Nr. 61, Haut und Haar. Nr. 62, Bevölkerungsdichtigkeit. Titel und Vorbemerkungen zum Atlas der Hydrographie. Titel

und Vorbemerkungen zum Atlas des Erdmagnetismus. Gotha, Justus Perthes, 1891. Price 3s. each part. (*Dulau, Agent.*)

Sheet 18 is devoted to permanent inland waters, of which twenty-seven examples are given. Sheet 61 exhibits, on two maps, the variations in the human race with regard to the colour of their skin, and the description of their hair with reference to colour and texture. Sheet 62 shows the density of the population of the world at the end of the nineteenth century; it is coloured to show the number of inhabitants to each square kilometre. Special maps are given on an enlarged scale of the United States and Europe.

At the end of this part appears the letterpress and title-pages completing the sections ii. and iv., Hydrography and Terrestrial Magnetism. Notice is also given that part xxiv. will not appear before Christmas, and xxv., the last, at the beginning of next year.

Schrader, F.—*L'Année Cartographique, Supplément Annuel à toutes les publications de Géographie et de Cartographie, dressé et rédigé sous la direction de F. Schrader, Directeur des travaux cartographiques de la librairie Hachette et Cie. Premier Supplément, octobre 1891. Paris, Hachette et Cie. Price 2s. 6d.*

This is the first annual supplement to geography and cartography, edited by M. F. Schrader and published by Hachette & Co. It contains three sheets of maps on which all the more recent explorations, geographical discoveries and changes in political boundaries of Asia, Africa, and America are laid down. On the sheet having reference to Asia, the routes of Grombitchevsky, Pevtsoff; the brothers Groum-Grjimaïlo; Rabot; and Bonvalot, are shown on separate maps. On the sheet devoted to Africa there are two maps of that continent, on one of which the political boundaries as they existed in January 1890 are shown, and on the other those of December of the same year. A map of the country between the Mobangi and Binuë, founded on the explorations of Cholet, Crampel, Fourneau, Morgen, Zintgraff, is given, and the routes of Stanley and Johnston are shown on separate maps. The remaining sheet contains maps showing the extent of the United States that has been officially surveyed, the approximate area of unexplored country in South America, the frontier of Brazil and Bolivia as laid down by the Mixed Demarcation Commission, and the exploration of the rivers Itapetinenga and Paranapanema by Sampaio.

Each sheet is accompanied by notes in which brief accounts are given of the journeys of the several travellers, and the geographical results obtained from each. This annual, if issued every year, promises to be a very valuable and useful publication.

Universal Atlas.—The —, complete in 28 parts, including Index. London, published by Cassell & Co., Limited, for the Atlas Publishing Company, Limited. Part 7. Price 1s. [*Presented by the Publishers.*]

Sheets 15, 16 contain a map of the British Isles. As regards the drawing of this map little remains to be desired, and it is in this respect quite up to the standard of those already published in the previous issues of this atlas; but it would have been well if more attention had been paid in the selection of the names, and the size of the lettering in which some of them appear. For instance, on the coast of Lincolnshire, "Donna Nook" is given in bolder type than many places of importance, the fact being that no such name should appear on a general map, on such a small scale, of the British Isles. No. 33 is a map of Denmark, with insets of Bornholm, Iceland, and the Farøe Isles. A map of Alsace-Lorraine and the Palatinate of Bavaria occupies sheet 34.

PHOTOGRAPHS.

Central America.—42 Photographs of Nicaragua, Guatemala, and Salvador, taken by Mr. Edward Gledhill in 1887, and presented by him to the Royal Geographical Society.

These form a very welcome addition to the Society's collection, which contains but very few photographs of any portion of Central America.

Egypt.—95 Photographs of Natives and Scenery of —. Taken by Messrs. G. Lekegian & Co., Cairo, and presented by them, through Major F. R. Wingate, R.A., to the Royal Geographical Society.

This is a very fine series, containing typical photographs of the natives inhabiting the villages on the banks of the Nile between Cairo and Dongola, and dervishes made prisoners by the Egyptian army at the battle of Toski. There are also numerous photographs of the scenery of Lower Egypt, its architecture, street scenes, and others illustrative of everyday life and industries of the people. The photographs have been carefully selected, and are remarkable for their clearness, and the amount of detail they show.

France and Switzerland.—75 Photographs taken in the departments of Alpes Maritimes, Var, Vaucluse, Gard, Haute Savoie (France), and Switzerland, by M. James Jackson, in 1890-91, and presented by him to the Royal Geographical Society.

These views illustrate the scenery and antiquities of the districts mentioned above. They are excellent specimens of photography, and form a welcome addition to the Map Room collection.

Iceland.—26 Photographs of South-west Iceland taken in the neighbourhood of Reykjavik, Hekla, the Geysirs, &c., by Captain A. F. Mockler-Ferryman, Oxford Light Infantry, in 1891, and presented by him to the Royal Geographical Society.

These form an interesting set of photographs of the scenery of south-west Iceland. Captain A. F. Mockler-Ferryman has on previous occasions presented the Society with a large number of characteristic photographs taken during his travels in Africa and Asia.

West Africa.—24 Photographs of Addo, Ilaro, and Igbessa, West Yoruba country, taken by Mr. Walwyn Holm, a native of Accra, during the recent expedition under George C. Denton, Esq., Acting Governor of Lagos. [Presented by George C. Denton, Esq.]

These photographs were taken by Mr. W. Holm, a native of Accra, during an expedition made by the Acting Governor of Lagos into the kingdoms of Addo, Igbessa, and Ilaro, on the western boundary of Yoruba. The greater number consist of groups of natives; there are also some excellent photographs of forest scenery, and the everyday occurrences of village life.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

showing
route of Lieut. Nurse
from
DUNKARAITA TO BULHAR.
1891.

1891.

Scale of Statute Miles.

Author's Route _____
 Heights in feet:



Note.

Except at Bulhar there are no villages or permanent settlements at any place on this map; the names being those of places which are generally used for camping, or where water is found.



Turner & Shawe, 43 Brewer Street, London, W.



PROCEEDINGS
OF THE
ROYAL GEOGRAPHICAL SOCIETY
AND MONTHLY RECORD OF GEOGRAPHY.

Journey through the Trans-Salwin Shan States to Tong-King.

By Lord LAMINGTON.*

(Read at the Evening Meeting, November 10th, 1891.)

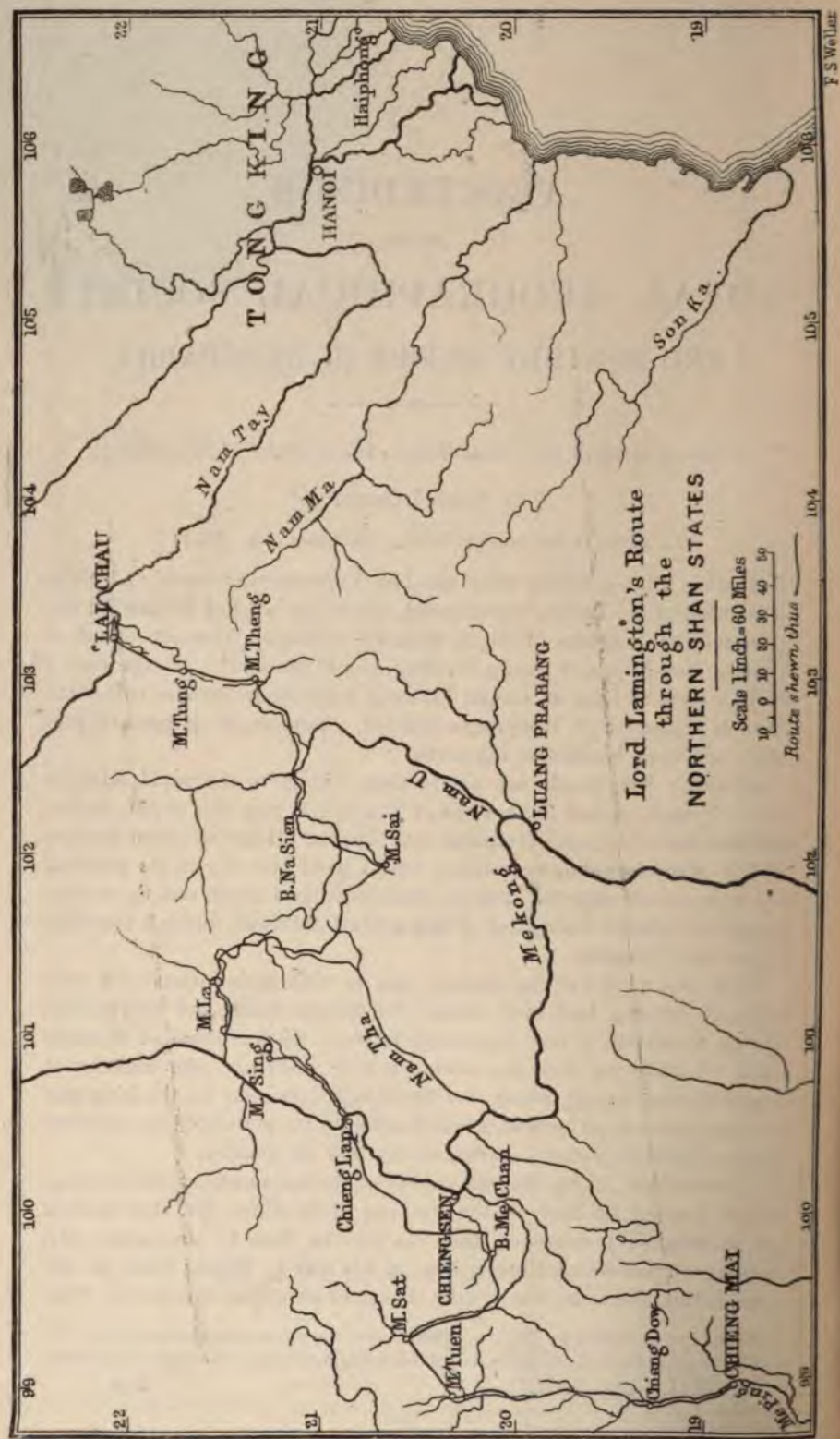
THE Shan States, which after the last Burmese war came under the protection of the Indian Government, are to the west of British Burma. The ancient kingdom of Siam, with its northern tributary states of Chieng Mai, Nan, and Luang Prabang, lies to the south. To the east, a narrow strip of Laos or Luang Prabang territory intervenes before the French possession of Tonquin is reached. Yunnan, an important province of China, borders on the north.

Perhaps few people are aware that, owing to the rapid advance of the French beyond the borders of Tonquin, it may not be long before her frontier will be conterminous with Burma. Hence the chief interest of the hitherto unknown country that I went over lay in its political and commercial aspects. But on this occasion I must strictly confine myself to a mere description of the route I followed through the Shan States into Tonquin.

The first object of my journey was to visit Siam, almost the only Oriental country that still retains its independence and originality, though the latter is now beginning to show the influence of Western ideas. I made my first acquaintance with Siam and the Siamese at Bangkok, the capital, where the cordiality shown me by the king and his ministers was an agreeable introduction to my journey in the interior. After a fortnight's stay I started on my way up country.

I arrived at Chieng Mai, the capital of the Laos country, after a three weeks' journey by boat up the Me Ping river which Mr. Holt Hallett has so admirably surveyed, and was just in time to accompany Mr. Archer, our Consul at Chieng Mai, on his way to Muang Tuen in the Shan States, where he was to take charge of an expedition coming from

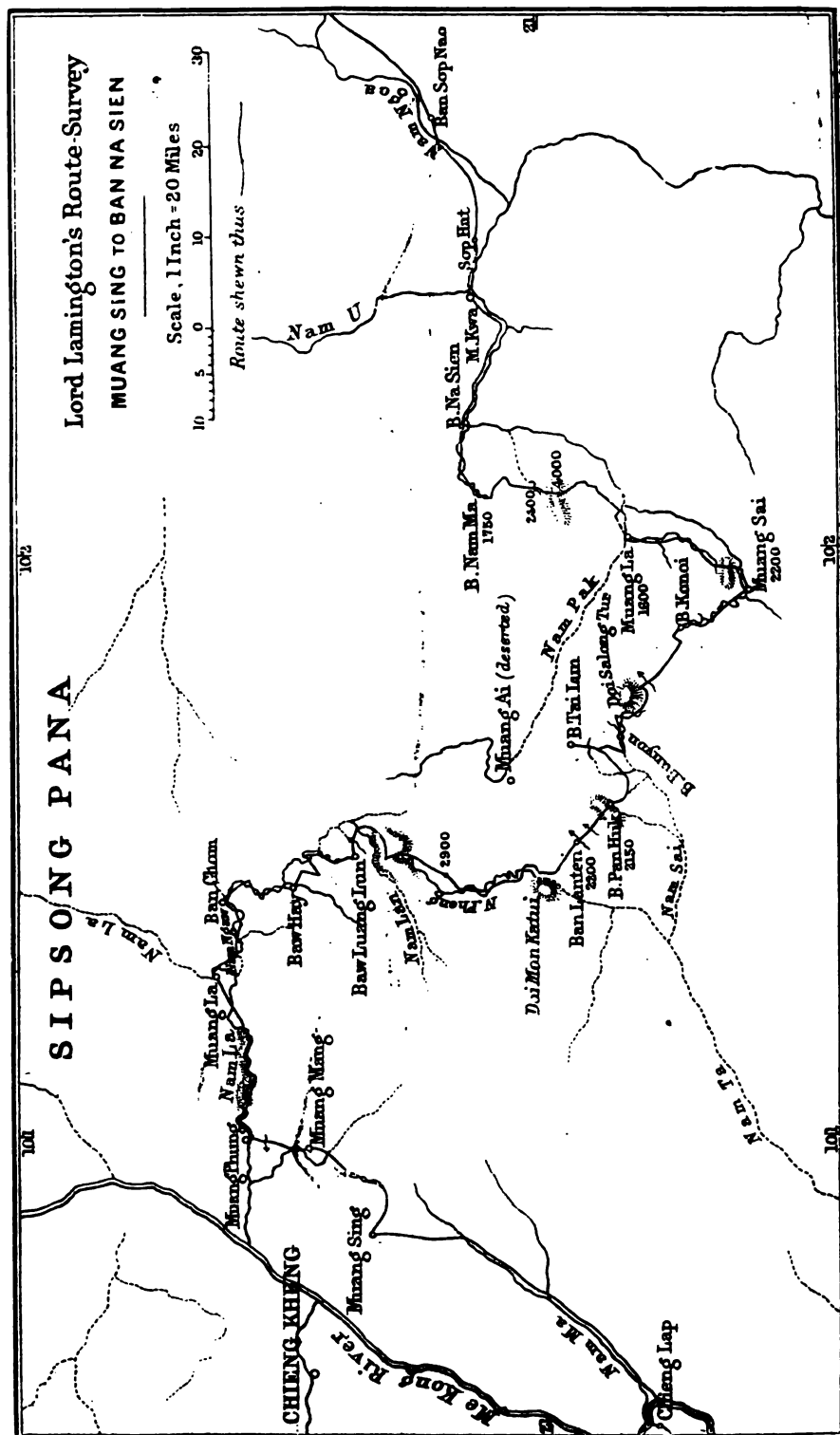
* The maps given at pp. 702-3 in illustration of the paper are provisional only. We hope to be able in a subsequent No. to publish a complete map of the country traversed.



Lord Lamington's Route-Survey
MUANG SING TO BAN NA SIEN

Scale, 1 Inch = 20 Miles

Route shewn thus



W & W

Burma, appointed to enquire into and survey the frontiers between the Shan States and Siam. I had a few days in which to find transport and to make arrangements. Stores I had brought with me from Bangkok. My pack-animals were mules owned by Hös or Panthays; these are Chinamen who had been driven out of Yunnan for rebellion some few years ago, and had for the most part settled in Burma, carrying on trade in the dry season by caravan. I was fortunate enough to find a party having only ten mules, a sufficient number for my requirements; 25 mules being the least number they usually venture to travel with. A Siamese commissioner had to be appointed, and the authorities had some difficulty in doing this, as it is not a favourite post. The pay drawn is very small, and if all the proceedings are not carried out to the satisfaction of the Government, the consequences are probably unpleasant. After divers delays, we started on Dec. 10th, making only a short march the first day. The first two days we travelled through level country, occasionally cultivated, but capable of great development if the jungle were cleared. We then ascended the right bank of the Me Ping along a narrow and precipitous path. The scenery was lovely, the water rushed along hemmed in between steep hills clothed with palms, plantains, tall forest trees, and all the wonderful luxuriance of tropical vegetation. At night we often heard tiger and the barking of deer, whilst in the morning our march was accompanied by the melancholy wailings of the monkeys called gibbons. Before reaching the approximate frontier, the most prominent feature is Doi Chieng Dow, a mountain which rises to the west out of the plain (showing to the north a precipitous face thousands of feet in height). The village of Chieng Dow is palisaded, and is the place whither witches are banished.

The population as we travelled north were more clothed and dirtier. The country was covered with jungle, which became much less dense where there were teak forests. The villages, very small and rare, were almost hidden in the jungle. A narrow pass strewn with boulders and with precipitous and overhanging rocks on the right took us up to the watershed between the Me Ping and Salwin water-systems. All along the route, wherever there had been some former encampment, were traces of little shrines or plaited bamboo devices to keep off the devils. We found the village of Pong Pa Chem and others beyond the frontier quite deserted since recent political disturbances.

It is owing to constant raids and the submission of the weaker state to the stronger neighbour, that it is so difficult to determine now the proper frontier. Our approach, when about two miles from Muang Tuen, was marked by the coming of the mother of the Governor to greet us, accompanied by a retinue of brilliantly dressed attendants. It must have been rather a severe business for the old lady, as the day was hot, but she was anxious to win our favour, and afterwards was often to

be seen fording the river towards our camp with the gaudy coloured procession filing behind.

Whilst awaiting the arrival of the party from Burma, which included Mr. Scott, Acting Superintendent of the Shan States, Captain Fulton of the Ghorkas, and Dr. Gray, I devoted a day to seeing where the river Hang was reported to disappear under a chain of hills. After a ride of eleven miles, and the roughest scramble I had ever done for four miles down a rocky gorge, constantly having to ford the river waist deep, the object of my search was seen. The cave where the river enters on its subterranean course is in a sheer face of rock some 300 feet high. The height of the cave I made to be about 140 feet, its width at the entrance 300 feet, broadening in the interior to nearly 500 feet; the depth was about 300 feet. At the right-hand bottom corner, a tunnel at an angle of 45° with the cave provided a passage for the river. I followed this for some distance, but with no other result than that of getting wet. It is said of this cave that a cut teak log floated down never reappears, whereas an entire tree with its roots and branches makes the journey successfully.

Some of the Musur tribe paid our camp at Muang Tuen a visit. They said they only came to the valley when "the frogs did not croak," i.e., in the dry season. Like all the people of Indo-China, they regard any other district than their own as being fatal to health at certain seasons. They dress in blue jackets and trousers and turbans; a pretty girl who was with them had a graceful long mantle with a broad collar and many ornaments of silver. In every party of these people I came across there were one or two who carried musical instruments in the form of a hollow gourd in which are five bamboos, both gourd and bamboos having holes bored to give the notes. The music is weird and melancholy.

Our route lay easterly, up an affluent of the Nam Tuen, and then we crossed the watershed, some 3300 feet high, between the Salwin and Me Kong. The jungle was dense, and the bamboo thickets made a most lovely scene by moonlight. One camp in particular was most picturesque, with long vistas of bamboo arches of every size, whilst through them a rushing stream took its way. Nor, as a ready-made bonfire, was a dry bamboo clump to be despised on the cold damp nights.

Three days' march brought us to Muang Sat, where the party was further joined by a commissioner from Chieng Tung; he complained bitterly of his fate, both on account of his age, and also through fear lest he should do anything to displease his chief, who is not renowned for an amiable temper.

Muang Sat is a very small village with a decent market for yams, plantains, pork, and native medicines. The plain of the same name is very extensive, but not nearly fully cultivated. The Me Khok, a fine river some 60 yards broad, flows on the eastern side of the plain.

Our further route lay down the opposite or left bank, but the crossing took some time, as what with elephants, mules, and bullocks, our party was large, and there were only two small canoes available to transport the baggage.

From Na Mon, a small village which we left on January 2nd, until our arrival at Ban Me Chan on January 26th, the main body of the expedition never passed a single inhabited dwelling; making some allowance for the time occupied by halts. We did come on the remains of some villages, but they had all been burnt in recent raids. Owing to its having been so long disused there was great difficulty in determining the path, and the sepoys had to act as pioneers in cutting and remaking it. On leaving the Me Khok at Viang Ké, we travelled in a north-easterly direction towards Ban Me Chan and Mek Kee.

Viang Ké, to judge by the great double ditch that surrounds the site, must have once been a large town. Now the jungle reigns supreme.

The village of Ban Me Chan marks the commencement of the plain of Chieng Sen, a tract of country some thirty miles long, and an average breadth of twenty miles. It would be very productive if there were a population in proportion to its size. The distant prospect was an agreeable change after the confined range of view in the wooded mountains.

After three or four days' easy travelling to Honglūk, we were once again in the Shan country. The ownership of the plain of Chieng Sen was the principal point of enquiry for the Commission, and from the want of any strong natural feature, and from the northerly advance of the Siamese in recent years, it will be hard to define the boundary.

As I wanted to enter Tonquin through the Sipsong Pana, a route which no European had hitherto travelled, and time was getting short, I with great regret had here to bid farewell to my friends of the Commission, and go on alone. This was by no means agreeable to my mulemen, who disliked going into a new country, and were still more afraid of having to return alone. However, extra pay tempted them, and in three days, leaving Honglūk on February 1st, we reached Chieng Lap, passing through a succession of small plains.

At Palao the country was quite park-like, but here my little party of eight men were first alarmed at the reports of dacoits. Near to this place I saw some women of the Kha Kaw tribe. They are of very low stature and extremely shy, bolting into the jungle if one looked at them. Their dress was dark blue, a jacket and a head-dress covered with beads and shells. They carried their loads on a little yoke supported by a band around the forehead. The lower part of their dress exactly resembled a kilt, having plaits and two lappets hanging in front that answered to the sporran. Most of them also wore leggings.

It was a little below Chieng Lap that Garnier, in ascending the Me Kong, had to forsake his boats and continue his journey by land along the right bank. Even here, some 1500 miles from its mouth, the Me Kong is a noble river. The natural bed would be about 600 yards wide, but where I crossed it was not more than 80 to 100 yards, very deep, and flowing between jagged rocks that protruded out of the sandy channel. A raft was fashioned out of two canoes and a bamboo platform to ferry over me and my belongings. This was not done, however, before some tapers had been burnt to propitiate the devils, and a sacrifice of rice, nuts, and a rupee offered up on the rocks. I was unaware of the ceremony till it was too late to see it. The eastern or left bank of the river is Chieng Kheng territory. We had to descend it for some six miles, marching over the burning sands of the broad river-bed. At the southerly bend of the Me Kong I left its banks and took a north-easterly course, which for two days and a half followed the valley of the Nam Ma.

From Muang Long, which we reached on the second day, there was a series of narrow fertile plains till the path crosses a low watershed and enters on the great plain of Muang Sing. Fire was raging over the pampas, roaring and devouring the trees and all vegetation. I had to be cautious in approaching Muang Sing, the capital of Chieng Kheng, as the Sawbwa, who is by rights a vassal of Chieng Tung, had been annoyed at not obtaining the latter state for himself instead of his nephew, and had placed himself under the protection of Nan, a Siamese State. Chieng Tung being tributary to us since the Burmese war, I did not know how far his animosity might extend. Whilst I sent on emissaries to ask for camping ground, a shouting and yelling crowd of men dressed in black engaged in dragging timber, spying a curious object, dashed towards me. However, they were most peaceful and delighted at examining any of my possessions. The whole of my stay at Muang Sing they followed me about like a tribe of children filled with wondrous delight. I learnt they were Khas, brought down from the hills to build a new palace for the Sawbwa. They have no religion, and for food were given a daily allowance of dogs from the neighbouring villages. All was arranged amicably with the Sawbwa, and my camp was pitched near the market to the east of the town. I paid a visit to the chief, a kind, portly old gentleman, who conducted me to some cushions to repose on, I clinging tenaciously to his hand, as the bamboo flooring was most uneven and springy. All his ministers were assembled, and a motley set they looked, the Mongolian type being very predominant. Whilst the interpreters were at work the contrast of the soft sounds of the Burmese with the harsh tones of the Shan language was very noticeable. I learnt that the capital had been shifted to this side of the Me Kong only seven years ago, that it already numbers 2000 inhabitants, and that I was the first European to visit the place.

We interchanged some small gifts, mine including some jam, which especially delighted the chief.

One morning there was a market, and it was by far the most interesting I had seen for variety of type and costume of the country people. There were some more Khas, but of a type different from those I have before mentioned. These wore jackets of red, white, and blue, or black, made of silk or velvet, fastened across the breast and trimmed with embroidery. Their turbans crossed diagonally in front, displaying coloured ends. These hill tribes are so numerous (of the Khas alone there are four distinct subtribes) that it would require a most intimate and prolonged residence in the country to master the different varieties. Manchester goods, brought by the Ho traders from Burma, were on sale. One gentleman, from the pride with which he displayed the word "superior" worked in gold paper letters on his red blanket, evidently thought he had secured a very valuable garment. Bryant and May's wax matches (the only occasion I ever saw any in my travels) were selling at 4 annas a box. Ironware, such as pots and dahs, could be bought here. Chickens and eggs were wanting, but in other respects it was by far the best market I had seen. Altogether in my opinion Muang Sing has a future before it, and the plain, though not nearly of the same extent as that of Chieng Sen, has yet a most promising appearance. I trust that, as I believe he is willing to do, the chief of Chieng Kheng will once more return to his proper allegiance. The position of Chieng Kheng on the trade route from the trans-Me Kong States of Chieng Hung to Northern Siam makes it a trading station of some importance; and the natural development of trade and improvement of communications in these regions must all tend to enhance the value of Muang Sing as a future commercial centre. The climate also is far cooler and more invigorating than that of Siam; while the scenery is less tropical, the jungle giving way gradually to the fertile open plains peculiar to the Shan States. The people also become a taller and stronger race, approaching gradually to the Yunnanese type.

The difficulty of obtaining here definite information as to the route to the Nam Tay or Black River was great. Very few people knew the country even as far as the watershed between the Me Kong and Nam U, and of these all differed as to the possibilities of the route. Information was never reliable for more than two days' journey ahead at the most, and drawing maps on the ground was the only method at getting an idea of the relative distances between places. My object was, if possible, to find a road to the Black River without having to go to Muang Sai in the south, or by way of Chieng Hung in the north. The latter I knew to be Mr. Archer's intention to attempt, and I therefore wished to cover other ground. My start took me in a northerly direction to the extreme end of the plain, having several villages scattered about on either hand.

Our march was not a long one, and to no purpose, as during the night dacoits stole some mules, and in the dark jungle pursuit being impossible, we returned to Muang Sing on the following day. I interviewed the Sawbwa and demanded two other mules. After a long palaver with his ministers he consented. However, as the two stolen mules returned soon after, the dacoits had probably taken fright and had allowed the animals to escape. The chief warned me that I should meet many bad people when out of his territory. Having been delayed two days I crossed the low watershed between the Nam Sing and the Nam Mang, which flows into the Nam La (?), and then the path lay through a narrow valley gradually opening out into the small but well cultivated plain of Muang Mang. Opium, as we go north, is more extensively smoked, and from one village the people came rushing down clamouring for it; when they learnt we were not traders, their disappointment was great. A good many opium caravans pass through here, for the poppy cultivation which commences about this latitude is extensive to the north and west, and the produce is thence taken southward and bartered chiefly for cotton.

Some little distance after quitting Muang Mang, the march or boundary between Chieng Kheng and Muang Phung is reached, and is marked by a low mud wall with a bamboo palisade on the top. The going is extremely easy, as the road leads through the extensive plain of Muang Phung. A high mountain of sugar-loaf form rises to the north-east, called Loi Cham Lem, and rather more to the east another with a sharp double top, Phu Chu Phu Cha. They are a great distance off, and overtop any other mountain, but after leaving Muang Phung I never got any other view of them. Muang Phung is one of the twelve states of the Sipsong Pana, of which Chieng Hung is the chief, and to the Sawbwa of which the rest pay their taxes. The Sipsong Pana is held to be the richest and most fertile region in the north of Indo-China. The western bank of the Me Kong may perhaps offer superior advantages for a railway, but at all events there would be no obstacle, having once crossed the Me Kong at Chieng Lap, to the prolongation of the Burma-Siam railway as advocated by Mr. Holt Hallett and others, along the route I had come; and the general appearance of the country would warrant the belief that it could be easily continued from Muang Phung to Chieng Hung. This is one of my reasons for hoping the Indian Government will accept the suzerainty over Chieng Kheng, which, as I have already stated, is naturally tributary to Cheng Tung, one of our protected states.

At the request of the Sawbwa of Muang Phung, I made a longer stay than I had intended. We interchanged visits and he showed a childish delight at the most commonplace objects. He was supposed to be bad tempered and proud, but he must have reserved these qualities for his own subjects. He was most anxious that I should make my journey to

Muang La as rapidly as possible, owing to the chances of dacoits being about. These are said to be refugees from our war in Burma, or followers of the Minghoon prince, who escaped from our custody, and has ever since been intriguing and causing disaffection in Burma and the Shan States.

Iron is found in the state. The houses situated in the plain numbered about 400. The further route lay up the Nam La, a picturesque river, but enclosed in a deep valley and with no human habitations. In the river large fish were jumping, and at any village one passed the inhabitants were usually engaged in fishing, but it was most rare that I ever succeeded in obtaining any to eat. The track I went by must have been of considerable age, as occasionally it was worn so deep into the soft rock that my mules could not pass with their packs on. Muang La, another town of the Sipsong Pana, did not strike one as of great importance, nor was I greeted with the warmth usually shown me. The difficulty was to determine who was chief; I finally made out there were three, so I paid most attention to the eldest, whom I likewise doctored. A funeral took place whilst I was here; the body, accompanied by women wailing and shrieking, was carried in a white shroud to the jungle, where it would be left for two or three days and then buried.

Some tremendous thunderstorms burst over the place, making the travelling, when I left, very hard work. In spite of the vexatious delay, it was ludicrous to see us toiling with feet and hands up a steep greasy path in the jungle, often slipping back till arrested by a tree. The route I took had been in a northerly direction from Muang Sing to Muang Phung, thence to Muang La it changed to the east, and from Muang La to Muang Sai, generally speaking, it might be said to be south-easterly. After Muang La I had gradually to abandon my idea of finding any way into the Nam U valley, except by Muang Sai. It was remarkable how absolutely ignorant the people were of their country, giving the vaguest and most absurd ratio of distance and time between places. The road to Ban Chom, a town in the Chieng Hai district lay up the Valley of Nam Ngaw. The village of Ban Chom is situated very much in the jungle, so much so, that in broad daylight a tiger killed a calf not twenty yards from the temple where I was encamped, and I was told they often came into the village. This village pays a tribute of 100 rupees a year to Chieng Hung. Our further journey, till we arrived at the narrow valley in which the village of Baw Hay is situated, was rendered tedious by the continual crossing of the river strewn with boulders, and having deep rocky holes.

Usually the villages are almost unseen in the jungle, or grouped together at one corner of a paddy field, so that Baw Hay, built on a rocky knoll, by contrast reminded one of an Italian village. "Baw" signifies "well," and I went to visit the salt wells near the stream. I

only did this after strenuous opposition on the part of the headman of the village, who first urged that my clothes would get dirtied, then that the spirits would get angry, then that tigers would devour them all, finally that I should get fever. None of these mischances befalling me, I hope that they have not suffered. The mines are a collection of little huts having pits into which the brine taken from a well is put, then it is boiled and the salt moulded into brick-shaped forms. Salt, obtained from wells, is one of the chief articles of trade, and the Panthay caravans having brought opium in exchange take it away on their return westerly journey. Cotton also they obtain from the natives. This is the wild cotton collected by the hill tribes, and which the Panthays, having established themselves in some centre, go about purchasing from the different villages till they have obtained the amount they require. Very picturesque are these caravans. The first notice of their approach is given by the gong sounding through the jungle to encourage the mules. The leading mule is usually decorated with a highly ornamented headgear leaving spaces only for the eyes, peacock's or pheasant's feathers wave about on the top, and little flags project from the sides. There is a man in charge with each set of five mules. For defence they carry old muzzle-loaders, dahs, or a great trident some seven or eight feet long. After leaving Baw Hay we came upon a small band of suspicious-looking people, so I questioned them and gave them to understand that we were prepared for robbers. They apparently took the hint, for we were not troubled by them, whilst I afterwards learnt for certain that they were dacoits.

At some other salt mines called Baw Luang Lun, the valley was more free from jungle than usual, and had a pleasant green park-like look, whilst the air was fragrant with the pommelo blossom. A short distance beyond this village the path crossed a low watershed between the drainage area of the Nam La and that of the Nam Ta, both of which flow into the Me Kong. Pine trees were growing here, and I noticed now, and on other occasions, that pines did not necessarily betoken a higher altitude, but were often growing at a lower elevation than the ordinary jungle. There were two rather high ascents of about 2900 feet to be made whilst crossing the head waters of the Nam Ta; the names of these hills were Doi Ta Pi and Doi Mon Katui. The jungle was continuous and good camping ground entirely wanting.

After crossing Doi Mon Katui there is a small village called Ban Pan Huk, the people of which are Thai Dams and come from the Muang Theng region. Their houses were dirty, and, unlike those of the Shans, the floors were not raised above the ground. The women wear the regular Muong attire, a long black upper garment cut away at the sides, and dark blue trowsers. Their hair is parted for two or three inches, with a traverse parting close to the head. The men have black turbans and long black overcoats and trowsers.

At Ban Bunyon the people are Kamoos. The women's petticoats, instead of being horizontally striped their whole length, have broad red, white, and blue stripes in the lower part of the front.

The information as to the road became more mixed, and after losing time and temper by following for some distance a path impracticable even for loaded coolies, it became certain that the only possible way was by Muang Sai, the one route I had hoped to avoid taking. From here there is a path to the east leading to lead and iron mines, but pack animals are unable to go. Caravans of female coolies attended by one or two male protectors seemed to be the fashion hereabouts. They were extremely shy, and if they had sufficient notice of our approach would bolt into the jungle. We had now to cross the watershed between the Nam Ta and the Nam Koh, whose waters flow into the Nam U. The watershed is 3600 feet, the ordinary elevation of the valleys being about 2000 feet. The climb is not therefore of great height, only that these divides represent a long series of ascents and descents.

Ban Konoï is a prettily situated village on the banks of the Nam Koh, the immediate surroundings giving it the appearance of a large orchard. The road on from here to Muang Sai was a pleasant afternoon's march.

Muang Sai is on the right bank of the Nam Koh, and owing to the thickness of the jungle it only comes in view when one arrives immediately in front of it on the opposite bank. A Siamese official from Luang Prabang had come to the town in case the Boundary Commission should visit the place. It was like a return home to see once more the short-cut hair of Siam. He expressed great regret that he had been unaware of my coming or he would have made preparations to greet me. We spent a pleasant evening discussing matters by means of my interpreter. It is usually here that the Panthay caravans load up with cotton. He informed me that there were only thirty houses in the place, but this seemed a small estimate. The people are Laos, dressed like Shans, excepting that they kept their hair cropped around the sides of the head in old Laos fashion, though even then some of them wore turbans.

We had taken twelve days from Muang Sing to Muang Sai. From here the path was in a northerly direction to Muang La, which I reached in one day, leaving Muang Sai on February 23rd. Muang La charmed me more than any place I had been to. Instead of the usually scattered houses with compounds, there was quite a little street in appearance, reminding one of a Swiss village. The town is on the right bank of the Nam Pak, which we forded and camped on the further bank; by mistake we took up our quarters at first in the cemetery. There was a bridge (only of use in the dry weather); it was made of bamboo caissons filled with stones, and planks laid from the one to the other. On the left bank were salt works kept in the neatest order. The land by the river was

banked up with stones to form broad terraces covered with light earthy soil. This is taken away in the morning, having become impregnated with salt. It is then boiled in split bamboos over a fire burning in a long earthen trough. It was such a change to see a place with the people so busy. They were cheerful and extremely pleasant to talk to. It made a pretty picture in the evening light: the narrow valley enclosed by the dark hills, and the dusky forms of the men and women bringing their baskets of earth and spreading it carefully over the terraces.

There was no path by the river practicable for mules, and I did not venture to let them leave me and go on by water, as I should require them later on. Consequently we had to take a path along the mountains on the left bank of the Nam Pak, and one which I could not learn had ever before been used by pack animals. It was by far the hardest travelling I had done. We took three days from Muang La to where we rejoined the Nam Pak. The greatest altitude we went up was 4000 feet. Some of the ascents were, I feared, impossible for loaded animals; and the narrowest of tracks on precipitous slopes, often blocked by fallen timber, made our progress slow, though I had eight natives cutting a way. One pony rolled over the edge, but curious to relate, after two hours' work, was brought up again, not much the worse. At another spot the path had broken away, and there was only a projecting boulder to enable one to scramble over the breach. It seemed impracticable; fortunately, however, whilst my retinue were declaring the impossibility of proceeding, the leading mule tried the place of its own accord, and, being successful in making the double jump, the rest had to follow.

We were on the paths of the nomadic hill tribes, who just clear the jungle here and there to grow paddy, and therefore this was almost the first opportunity I had of getting a distant view. A feeling of awe came over me when there was nothing to be seen but a crowd of jungled hills, and after passing one of those clearings the dense impenetrable shade of the forest seemed intense. The hill villages were miserable places, with nothing to offer or sell. But Ban Ma, situated in a valley, was inhabited by some of the Thai-Dam from Muang Theng, whom I have before described. They were very well-to-do. The three head men came to do homage, prostrating themselves three times, and also made me offerings of rice and eggs. The women hearing I wished for some of their home-spun petticoats, brought a great variety to choose from.

I saw evidence of other European influence in the shape of a French ten-centime piece on the neck of a child; all through the country I had been passing, the only coinage that is current is Indian silver. From this village we went east, following the Nam Ma and Nam Noi. Then our difficulties began again; the valley contracts, and the ribs of rock project into the river. I was assured by the natives

that one place was impracticable, and it was only after cutting the jungle for a quarter of a mile on the steep opposite bank that the party managed to get on. At length we again reached the Nam Pak, and camped on the right bank at Na Sien. I was told there was no further road for mules, but I determined on putting the loads on a raft, and allowing the animals to get along as best they could. My mulemen were in despair: for many days they had been imploring to be allowed to be off their bargain and to return, and they said now they were worn out and could not face further difficulties. I was inclined to let them off, as a boatman said he could take me all the way by water to Muang Theng. Fortunately for me I hardened my heart, and determined on keeping to the mules, as there would not have been nearly enough water in the Nam Ngoa to have allowed the carrying out of this plan.

The next day saw three of the party in a canoe, the baggage and one of the interpreters on a raft, and the rest had to scramble with the mules along the banks. The boatmen handled the canoe very skilfully; and it was pleasant, after the hard travelling, to lie down, with the occasional excitement of getting splashed when shooting a rapid. The raft came to grief, and only arrived at the camp long after sunset, having accomplished the latter end of the journey by the light of my solitary bull's-eye lantern. We passed some young Poungees or priests in a canoe, decorated with little tricolour flags, having "Vive la France" on them. When I reached the Nam U, there was a large tricolour flying on a boat, which had lately brought up two Frenchmen from Luang Prabang. They had gone to Muang Sai, so I had missed them whilst coming along the hill road. I subsequently learnt they were Messrs. Macey and Massy, who were going into the Sipsong Pana with the view of opening up trade. The Nam U, one of the largest affluents of the Mekong, was some forty yards broad, some five feet deep, with a current of about two and a half miles an hour. The mules swam the river, and proceeded down the left bank as the road to Muang Theng branches off at Sop Hat, some nine miles further down. Sop Hat is a Siamese guard house. The road on followed a range of hills, with water at only rare intervals, and I, not fully understanding this, started rather late, with the result that night came on and we had no water. The Hos refused to proceed in the dark, and in a spirit of general discomfort we had to go supperless to bed.

The next morning from a hill top a splendid panorama displayed itself; the mist in the valleys had the appearance of a ruffled billowy sea, but motionless, studded with islands fringed to the water's edge with lovely vegetation. Even my Chinese interpreter admired the beauty of the scene. Sop Nao is the easternmost Siamese post before reaching the first French station. It is a well-to-do village, and laid out with considerable neatness. On returning from a stroll after my

frugal evening meal, I heard, to my astonishment, such words of command as "Shoulder arms," "Charge bayonets," &c. This turned out to be my Chinese interpreter, We Yan Hu, who had been a volunteer in Burma, engaged in putting through his drill a Siamese sentry posted to protect my property. The drill in Siam is or was entirely carried out in English. The path as far as the French frontier was thickly overgrown, and necessitated a great deal of cutting—as what little trade exists is carried on by river.

At times the fallen timber could not be circumvented, and was so large that ramps had to be constructed, by which the mules could get over. The watershed forming the frontier has an elevation of 4400 feet, with a very steep descent, of which my interpreter took advantage by sliding down on a plantain leaf, though it brought him ultimate discomfiture. In trying to push on to Muang Theng I got benighted in the jungle, and was without food—except a little rice—or covering, as the mules had not been able to keep up. Most of the night was spent in putting fuel on the fires, as the fall in temperature always felt most bitter after the heat of the day.

The next morning we passed through a fine grassy plain previous to arriving at the Nam Ngoa. Some large deer darted away at our approach, and wild cattle were seen not far off. At length, after wallowing in deep muddy holes, we traversed the Muang Theng or Dien Bien Phu plain, which, though there had been but little rain, was partially under water.

By 9.30 a.m. on March 4th I heard the French bugle, and crossed the embankment surrounding the fort. Captain Leger, of the *Infanterie de la Marine*, came to greet me, and I was soon comfortably lodged in a bamboo house, also—what was more to the purpose—had a good meal. There are only a few native houses near to the fort, Muang Theng village being five miles away. The fort is situated in the middle of the plain, which is about 15 kilometres long from north to south, and about six or seven broad. The Nam Houm flows close outside the parapet, and has its banks smothered with sweet roses. In the rains the whole country is inundated, and even when I was there, Captain Leger said I should only have to remain a few days to get fever. There were two European non-commissioned officers besides himself, the troops being *tirailleurs* or *Annamites*. Son La Chau is the present headquarters of the district, though they draw their stores from Lai Chau on the Black River, four or five days' march.

After spending two nights at Muang Theng, I left for Lai-Chau, or Mung Lai as it is called by the Siamese. The travelling now was very different from what we had experienced; the whole way to Lai Chau the path, with the exception of a few rocky places, was kept in good repair; the rivers and streams had bamboo bridges of sufficient strength to bear laden animals.

At the village of Na Thang, two hours from the fort, the road to Son La branches off. Silkworms are bred here; but the village struck me as miserably poor. Provisions were double the price we had paid in the Shan States, and neither plantains nor goor (coarse sugar) were obtainable. On leaving the plain, the altitude of which is 1800 feet, we crossed the watershed (2700 feet) into the valley of the Nam Pun.

After the junction of the Nam Mun the road takes us up the valley of the latter stream, which is very charming with its deep rocky pools. But we had one most unexpected climb. The watershed leading over into the Nam Tay or Black River, instead of being 1000 feet, as I had been led to expect, above the valley, was nearer 3000 feet, giving one a hard climb in a mid-day tropical sun, and for five hours without water. I now learnt the benefit of the jungle which I used to abuse for shutting out all views. The French say the natives have cleared it away, the latter that the sun sets fire to it. I could see no signs of any cultivation and should imagine that the soil was unsuited for jungle growth. On the crest of the watershed are two depressions, which during the rains must form lakes, as there appeared to be no outlet. For two hours we skirted the valley high up on the mountain side, with magnificent scenery stretching away to the north-west. Half-way down we came to a spring of water, and a native brought in a bunch of grapes the size of small peas.

Our last camp was at Muang Tung, where three of our mules were killed by tigers during the night and close to the village. Fortunately the march to the Nam Tay was only some nine miles, and very easy travelling down a narrow valley studded with villages. The post is on the north bank of the Black River and a boat shoved off to take me over. On landing on the rocky promontory, Captain Seignier and M. Pellitier came down to welcome me. As we climbed up the steep path I was shown a flood-mark 66 feet above the normal river-level. It was almost incredible. The size of a town in Indo-China must not be gauged by the size of the lettering in which it is printed. At Lai Chan the hills rise abruptly from the valleys of the Rivière Noire and Nam Ma, leaving space for only two or three native houses, and the half company of tirailleurs take up most of the room. The Europeans were only five in number, but it is a deadly place for them, as the well-filled little cemetery only too sadly testified. The remains of former brick dwellings of the Chinese were to be seen, as also the wheel of a gun-carriage brought by the Siamese in one of their wars; which, considering the nature of the country to be traversed, must be regarded as a wonderful performance. The Black River might well be so named, for its valley is precipitous and gloomy, and the valleys that run into it, excepting the one I had descended, are steep and narrow, giving, in spite of the sun, a sombre and chilling effect. The gorge through which the river pursued its course was particularly precipitous,

and was a mere cleft in the range of mountains. A storm at night made not only the frail bamboo houses shake, but seemed as if it might sweep away the very mountains in its tempestuous rush down the defiles.

Provisions, at all times dear here, had increased in price owing to failure of the paddy crop, and a disease amid the chickens. To get rid of this last evil, the corpse of a defunct fowl, hoisted on a high bamboo, was waving about in the air.

Here I had to part with my men, except the Chinese interpreter, the services of the other one who had acted as intermediary interpreter being now of no use. They had behaved very faithfully. My mulemen, through fear of attack, took a draft on Chieng Mai for half of their pay, but to this day I have heard nothing further of them.

After some delay in getting coolies for my boat, I left Lai Chau on March 11th, having the warmest recollections of the hospitality I received at the hands of the two French officers, and greatly did they envy me my departure. There is a great variety of hill tribes in these parts, some who tattoo their faces where their beards and moustaches should be, others whose women-folk raise their petticoats according to their wealth, others who drink through their noses. These are customs I don't myself vouch for, and which may be classified as travellers' tales.

The first day, descending the Black River, there were many rapids to shoot, and it was exciting work to see how swiftly the natives turn the boat in the midst of the boiling water, which comes foaming and splashing over the sides. The first three hours the mountain sides were precipitous, then the hills became lower and more jagged with isolated pointed rocks. On the right bank, near to Na Shan village, for about a quarter of a mile, is an unbroken face of rock, hundreds of feet high, with numerous caverns at the base worn away by the water.

The river above Van Bu is little broken by rapids, but flows deep and placid, in fact with so little current that the four boatmen were unable to make headway against a strong breeze blowing up the river. The boats are most uncomfortable and quite unlike those on the Me Ping. They are some 45 feet long and 4½ feet beam; in the centre they have a circular bamboo and plantain leaf shelter, into which one crawls like a caddis-worm, and there sleeps and eats. When descending the rapids the water splashed over and burst through this frail covering, soaking me and my belongings. I preferred standing outside and watching the swift passage of the boat, through the roar of the waters, at one time apparently charging right on to a rock, and then the man with the stern oar would shout and stamp his feet, and the boat, beautifully guided, would whirl by the danger. However, the steersman said he could not see, and I had to retire to my cave.

At Van Bu a new French post was in course of construction, and the three or four Europeans there complained terribly of the fever

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exhaled in disturbing the soil. The officer in charge was a piteous spectacle to see; he could barely move for weakness.

Ta Chan, a little lower down the river on the right bank, is the port or point of landing for Son La Chau. A sergeant commanded the post; he was one of the few Frenchmen I met who had a good word to say for the Black River, either in the way of health or productiveness. The minerals he especially mentioned as being in abundance, and showed me specimens of gold, lead, iron, and copper. But so far as I could see, till the delta is reached, the sides of the river are almost uninhabited, and fertility of soil was quite wanting, though I was informed that flax, maize, and cotton are grown on the hills. To me there appeared the greatest difference between this country and the Shan States, the advantage lying with the latter.

A large rapid below this place, and then the water was of slow current till we reached Takao, where the steamer in which M. Pavie attempted to ascend the Black River was finally wrecked.

Van Yen is an important French post on the left bank, and is the headquarters of a district. When I arrived there were few troops present as a large column had just left in pursuit of pirates or dacoits. From Van Yen to Cho Bo is only one long day's journey in the dry season; the floods make the travelling just three times as quick. The journey up the river from Van Yen to Lai Chau in the dry season would take quite three weeks.

I arrived at Cho Bo just six weeks after the catastrophe when the Resident, M. de Rouvigny, was killed by dacoits, and the settlement entirely burnt. The other Europeans escaped into the jungle; but a French officer, and a Frenchman travelling under his escort, arriving at the post after the event, were both murdered whilst at dinner, by the militia, who had received orders from the chief of the dacoits to do so. The militia then joined the dacoits, with a large amount of ammunition and rifles. When I arrived, but little had been done to rebuild the place, and the marks of bloodshed were yet visible. At Cho Bo is a barrage of rocks, an obstacle to steamers going higher up the river, which otherwise they could easily do as far as Van Yen. I descended the river from Cho Bo for some distance in the gunboat *Montbrun*, and then, owing to the shallows, I had to continue my journey in a sampan, or large boat, till nearly opposite some curious rocks on the right bank, called from their close resemblance to the church, Les Rochers de Notre Dame. There was a temporary military post at Tuvu on the opposite bank, where the greatest excitement reigned, owing to an expedition having just returned after a two days' fight and victory with the dacoits, or "pirates," as the French call them. The whole country was in a state of ferment, troops being despatched in different directions, and burning villages and fire signals were visible all around.

I had an escort with me and was not allowed to part with them

before Hanoi. The country below Cho Bo gradually alters in character and becomes open, most fertile, and thickly populated, especially on nearing the junction of the Black and Red Rivers. At Vie Tri, where the Black River is joined by the Clear River, the delta may be said to commence. Vie Tri is a purely military post, and I again found excitement, owing to the despatch on the morrow of a large force in search of a quite different band of dacoits. The journey down to Hanoi was slow and tedious, but there was a charm, though a sense of awkwardness, in approaching again a place boasting anything of Western civilisation. The "Rue Paul Bert" is quite European; the success of the place, though, is entirely dependent upon the large official population. Improvements are being carried out; the most interesting feature being perhaps the Horticultural Gardens, started for the purpose of introducing new plants for cultivation into Tonquin. The results have been hitherto most satisfactory; and apparently tobacco, cotton, and coffee can all be grown. At present paddy, opium, and castor oil are what the natives are content with producing. Here my travels across Indo-China were really ended.

A steamer runs every day to Haiphong, the port of Tonquin, which, though well laid out, is not as yet the seat of great commerce. The Messageries Maritimes call here weekly; and after an interesting trip, calling at the different ports on the Annam coast, I was landed at the charming town of Saigon, having everywhere met with the greatest kindness from the French in their new Possession.

Previous to the reading of the paper,

The PRESIDENT said: I have to congratulate the Society upon being able to listen to so interesting a paper as that with which Lord Lamington is going to favour us. Starting from Bangkok, the capital of Siam, Lord Lamington proceeded into the interior, where he joined the party of Mr. Archer (who is also, I am happy to say, here present to-night), who was employed by our Government in making a delimitation of the boundary between the Shan States and the Siamese Territory. Lord Lamington and Mr. Archer travelled for some considerable distance together, then Lord Lamington diverged to the eastward and passed through nearly 300 miles of country, which had not hitherto been at all visited by—much less described by—Europeans. He kept throughout his journey a very minute record of all he saw, made a most careful survey, which accords extremely well with what the British had already done on one side, and with what the French had done on the other. At last he reached the French settlements at Tong-king, remained there for some time, and then returned to Europe.

After the paper,

Mr. HOLT HALLETT said: I was looking at Lord Lamington's survey at the Royal Geographical Society this morning, and find he has taken angles at every turn and twist of his path. This must have been very tedious and difficult work in the dense jungle through which the greater part of his track lay, particularly so as there are no made roads, but merely narrow winding paths for travellers and mules, many of which he had to cut his way along, as they had been deserted and overgrown during the recent disturbances in the country. I furthermore notice

Lord Lamington has taken a section of the portion of his route leading from Me Kong, or Cambodia river, to the Me U, which joins the Me Kong near Luang Prabang. This section is highly interesting and valuable, and I hope it will be published with the paper in the 'Proceedings' of this Society. The whole of these explorations of Lord Lamington are extremely interesting to me. He is the first European traveller who has approximately followed the course of the Me Kong from Chieng Lap, or Siemlat, northwards towards Kiang Hung. In his route from Chieng Lap to Muang Phung, Lord Lamington shows there were only two low watersheds to be crossed. These would certainly form no serious or expensive difficulty in the construction of a railway. From the surveys of Mr. Archer and Lord Lamington it is evident that there is no difficulty of any consequence to be met in the construction of a railway, all the way from Kiang Hsen (Chieng Sen), viâ Chieng Lap, to Muang Phung. The city of Kiang Hung has been recently moved to the east bank of the Me Kong. A glance at the map will show that it is not at all improbable that a railway passing from Burmah through Chieng Sen to Muang Phung might be continued at no excessive expense either through Kiang Hung or through the tea district of I-bang, &c., to the Chinese frontier-post of Ssumao. The journey is, therefore, of great importance in connection with the projected Burma-Siam-China railway, or any other railway from Burma towards Ssumao. The exploration is likewise of great interest and importance from a political point of view. It is apparent, from the remarks made by Lord Lamington, that since my visit to Chieng Sen and Muang Fang, and since Mr. McCarthy's survey was made, the French have made extensive encroachments upon what was shown by Mr. McCarthy upon his map as Siamese territory. This map was exhibited by Mr. McCarthy when he read a paper before this Society four years ago.* It showed the whole of the country between the Black River of Tong-king and the crest of the main range of hills, which divides the tributaries of the Red River from the tributaries of the Me Kong, as Siamese territory. Lord Lamington's remarks show that the whole of this great slice of country has now passed into French hands, and that French military posts are dotted over it. While France has been quietly annexing territory claimed by Siam, Siam has been further encroaching upon territory forming part of the Burmese Shan States, which are now tributary to us. At the time of my journey in 1884, I found that the Siamese had two or three years before driven the Burmese Shans out of the Burmese Shan State of Muang Fang and settled it with Siamese subjects. About the same time they had also crossed the Me Khok and occupied Chieng Sen, which has always been claimed by the Burmese Shans as part of their territory. When passing through the Chieng Sen plain I found that the Siamese encroachments did not extend further north than Ban-Me-Ki, and that there were several Burmese Shan villages within a mile or two of that village. Since then the Siamese have rapidly ousted the Burmese Shans, and have built a fort some 22 miles to the northwards. These high-handed annexations of the territory of our vassals must tend to foment disturbances and border warfare between states protected by us and the Siamese. Lord Lamington has shown that the Siamese are encroaching on the Burmese Shan States lying to the east as well as to the west of the Me Kong. All French officials and explorers in Indo-China have expressed the hope that the Me Kong from Cambodia northwards may be their future boundary with our India Empire and Siam. If we allow the Siamese to keep the territory of our vassals which they have recently annexed, we are simply paving the way for the fulfilment of the desire of the French

* November 14th, 1887, published in 'Proceedings R.G.S.' 1888.

Indo-Chinese officials and for blocking what may be our best route for the connection by railway of a Burmese seaport with the Chinese frontier-post of Ssumao. A railway leading from Maulmain or from Rangoon to Ssumao would enable us to successfully compete with the French for the trade of Siam, the Shan States, and South-western China.

Ssumao is excellently placed for purposes of trade. It is equidistant from Tali-fu, in North-east Yunnan, from Yunnan-fu, the capital of Yunnan, and from Meng-tzu, the Franco-Chinese treaty-post near the head of navigation on the Red River. Compare Ssumao with Bhamo and the Kunlon Ferry as a terminus for a railway to open up the Chinese province of Yunnan to our trade. Ssumao is twenty-one days' journey from Tali-fu, Yunnan-fu, and Meng-tzu. Bhamo is twenty-six days from Tali-fu; forty-one days from Yunnan-fu; and fifty days from Meng-tzu. The Kunlon Ferry is twenty-seven days distance from Tali-fu, forty-two days from Yunnan-fu, and at least forty-two days from Meng-tzu. A railway from Rangoon or Maulmain to Ssumao would convey our cotton-yarns and piece-goods for say 3*l.* a ton. The cost of carriage from Hong Kong, via the Red River, to Meng-tzu is about 15*l.* 8*s.* a ton. The cost of carriage from Ssumao to Meng-tzu is 13*l.* 13*s.* a ton. If a railway was made from Maulmain or Rangoon to Ssumao, the cost of carriage from either of those places to the Franco-Chinese treaty-post of Meng-tzu would be little over that of the cost of carriage from Hong Kong, via the Red River to the same place; and our goods could be conveyed to Western, Central, and Northern Yunnan at a considerable less cost of carriage than if conveyed by the Red River route.

But the cost of carriage is by no means the sole item that has to be taken into account when considering the question of constructing a railway to Ssumao. According to the Committee on Tariffs and Treaties, which was appointed by our Government, the French tax upon cotton-yarns has been purposely raised on all counts under 30's to 11*l.* 12*s.* 5*d.* a ton, so as to prevent Indian cotton-yarns from being sent via Tong-king into China. The finer yarns are taxed at much higher rates, 60's at 32*l.* 15*s.* 11*d.* a ton; 80's at 39*l.* 2*s.* a ton; our 8½ lb. shirtings at 37*l.* a ton, and 10 lb. shirtings and 12 lb. sheetings at 42*l.* 5*s.* 4*d.* a ton. It does seem to me, in this era of commercial warfare, when market after market is being closed to our goods by protective tariffs, and many more will be probably closed in the next few years, that it is bad policy to allow these encroachments of Siam upon the territories of our vassals to continue, and to take no steps for the construction of a railway to Ssumao. Lord Lamington has pointed out that throughout the country, from the Me Kong to the border of Tonquin, the only money met with is the Indian rupee and the imported manufactures of English origin. French explorers are rapidly mapping out the whole of this region and seeking to develop French trade. Lord Lamington has found that the French have already crossed the crest of the Tong-king range of hills and established a military post at Muang Theng, on the Nam Ngoa, a tributary of the Me Kong. It seems to me, therefore, a mere matter of time for the French to absorb the northern dominions of Siam. It is a strife between us and the French for the trade of Southern China and Central Indo-China, and I trust that our interests in these promising markets of the future will be duly attended to and safe-guarded. I am sure that you have been all interested in the capitally illustrated and able paper read to us to-night, and I do trust that it may lead you to take a thorough interest in the portion of our Indian dominions neighbouring China, Tong-king, and Siam, which in the opinion of the merchants and manufacturers of this country is very much more important for the spread of our commerce than the countries bordering the North-western Frontier of India.

Mr. ROBERT GORDON, C.E., on being called upon, said: There is very little that I can say affecting the subject of this paper. The regions to the north and south of it

I have already given my experiences of in this and other societies, and it is not quite within the scope of this Society to go into the railway question, but on this matter I entirely differ from the gentleman who has just spoken.

Mr. MORANT: I should like to put one question, if possible, to Lord Lamington, who since I met him in Bangkok has had an opportunity of studying what is going on in Tong-king and the neighbouring country. I should like to have the opinion of one of the latest travellers as to how far the term "dacoits" is reasonably applied to those people at present causing trouble to the French in that district, or how far it would be more rational to suppose them merely the natural and patriotic efforts of the inhabitants to throw off the foreign yoke.

The PRESIDENT: I am afraid I must ask Lord Lamington not to answer that question, as it is crossing into the bounds of politics.

The PRESIDENT in conclusion said: If no one else will address us—I know there are one or two present whom I should like to hear, but whom I do not think wish to speak—I think I have nothing to do but to ask you to give a very hearty vote of thanks to Lord Lamington for his excellent paper. It is not a small thing for one so young, just entering on public life, to be able to say with truth that he has made a considerable contribution to human knowledge. A good many objects of interest in connection with the paper will be open for inspection by members and their friends in the adjoining room, on the conclusion of the meeting.

Lord LAMINGTON acknowledged the vote of thanks and the meeting adjourned.

GEOGRAPHICAL NOTES.

Mr. Selous's New Map of Mashona-land.—We learn from Fort Salisbury, September 23rd, that the new map which Mr. Selous has drawn, and which includes the results of all his recent surveys with the recently corrected longitudes, had been entrusted to Mr. Theodore Bent for delivery to the Society. Mr. Bent was then about leaving Mashona-land for Cape Town on his return to England.

Mr. Theodore Bent's Expedition.—In a private letter dated Fort Salisbury, September 12th, Mr. Theodore Bent writes as follows:—"Since the close of our operations at Zimbabwe we have been on a long horseback trip to the Sabi, and have discovered other sets of ruins of a similar nature to those of Zimbabwe, and covered with several courses of decoration. From the results of our finds, specimens illustrative of which are now on their way home, I have little doubt that we shall arrive at a satisfactory conclusion as to the origin, worship, and mode of life of the ancient gold-working population. On our return via the coast, we hope to visit other sites of ruins in Motoki's and Makoni's countries, and if all be well we shall be in Cape Town by the middle or end of November."

The Rapids of the Mobangi.—The rapids of the Mobangi which presented so much difficulty to Mr. Grenfell and Captain van Gèle, were, in August last, easily surmounted in the steamer *Auguste Beernaert* by M. Delcommune.

Exploration in Somali-land and the Italian Possessions in North-east Africa.—Important work has been done this year by several Italians in exploring the unknown and little known portions of Somali-land and the neighbouring countries. The chief expedition so made was led by Captain Baudi de Vesme into the interior of Somali-land, and to the south-west of the province of Ogadayn. Unfortunately, his surveys, scientific observations, and collections were, on his return to Harar-es-Saghir, confiscated by the representative of the Negus Menelik, and thus the results of what was undoubtedly a very important journey have been practically lost to science. He left Berbera on the 25th February in company with M. G. Candeo, and the general direction of his route was S.S.W., and to the west of James's route in 1885. After leaving Harar he crossed the waterless plains to Milmil in the territory of Rer Ali, four days' march west from Koorati on James's route. Then turning more to the west, he proceeded to Rer Coshen and Rer Amaden. From this point an excursion was made to the north to the upper course of the Sulul. Subsequently the two travellers penetrated still further to the south-west until they reached the upper course of the Webbe in the country of Ime. This was the furthest point attained. The return journey was made along practically the same route, and on the 25th May the party arrived in Harar.—Another expedition to be noted is that now being made by M. E. Ruspoli, in company with Prof. C. Keller, the zoologist of Zurich, across the Somali country. The object of these travellers is to visit the oasis of Tug Faf, explored by James, and then to penetrate directly to the west to Ime, and to reach, if possible, across unknown regions Lake Rudolph. This expedition is likely to lead to interesting results with regard to the hydrography of that region.—A short excursion was made in May last by Captain Bottego through Danakil Land from Massowah to Assab; his route lay near the coast, but the country had not before been traversed by a European.—The expedition sent out under the auspices of the African Society of Naples, under the leadership of L. Robecchi, of which we gave a brief account in our last No., has from Obbia crossed the northern part of the Somali peninsula and returned to Berbera.—A further expedition is in course of being carried out at the instance of the Milan Society for commercial exploration in Africa. It started from Barawa, and will endeavour to reach the river Jub at Bardera, and then follow the stream upwards. M. G. Ferrandi is in command.

Caucasian Travel in 1891.—Herr Merzbacher, writing from Tiflis on the 20th October to Mr. D. Freshfield, gives the following news of the results of his summer in the Caucasus with Herr Purtscheller and two Kals (Tyrol) guides. The weather this year in the Caucasus, as elsewhere, was disastrous; the mountains were continually reladen with fresh snow, and only five or six days in a month were fit for high mountaineering. Despite these obstacles the travellers made the second

ascent of Tetnuld, visited all three peaks of the Leila, two only having been previously climbed, and ascended the central and highest peak of Dongusorun (57 feet higher than that reached by Fox and Donkin). The passage of the final ridge was so difficult that they preferred a new descent by the western flank of the mountain into the Nakra valley. They next climbed Elbruz and Adyrsu Bashi, near Urusbieh, and reached Mr. Cockin's peak of Janga from the Bezingi Glacier by a new route. Herr Purtscheller having left, Herr Merzbecker and the two guides proceeded to the Gonal Valley at the northern base of the Kasbek group, and from it ascended Kasbek, and made the first ascent of Gumaran Choch, a noble peak of 15,672 feet. Both travellers write that they found the difficulties and hardships greater than they had expected, and suffered considerably from the climate. Herr Purtscheller especially found the roughness of Caucasian travel a contrast to the comparative luxury of a well-organised caravan trip to Kilima-njaro. Herr Merzbacher took many photographs and observations, which he remains for a time at Tiflis to work out with the Russian staff, who, under General Shdanoff, have done, and are doing, so much for the scientific exploration of the Caucasus.

Depths in the Mediterranean.—An Austrian expedition for the scientific exploration of the Mediterranean found on July 28th last, between Malta and Crete, in $35^{\circ} 44' 20''$ N. lat. and $21^{\circ} 44' 50''$ E. long., a depth of 14,436 feet, the deepest sounding yet taken in the Mediterranean. At $22\frac{1}{2}$ miles south-east, a sounding of 13,148 feet was taken.

Ocean Currents and Temperatures in East Asiatic Waters.—Under this title Dr. Gerhard Schott contributes to a recent number (ix.) of Petermann's 'Mittheilungen' an interesting paper, which contains new information regarding the course of the Kuro-Shiwo and other currents in Chinese waters, and also as to ocean temperatures. The conclusions arrived at by the author are based upon researches made by him among the archives—principally ships' journals—of the German Admiralty, which contain observations of great value to science. With regard to the Kuro-Shiwo, the general result of Dr. Schott's researches is that this great ocean current is not so extensive as hitherto supposed. Throughout the whole of the year the warm stream is confined as a constant current exclusively to the west side of the line of islands Meiac-shima, Lu-Chu, and Linschoten, while the sea to the east, although showing at times displacements to the north-east, is otherwise quite motionless. The supposed constant current of considerable velocity just east of the Lu-Chu Islands does not exist. The Kuro-Shiwo, in the northern part of its course, shows more tendency to break through the island barrier to the east. Its principal outlets in this direction are the Colnet Straits (30° N. lat.), and the Van Diemen Straits (31° N. lat.). From this point to the meridian of the Kii Channel the current reaches

its greatest extent, and flows pretty close to the land in a north-east direction, with a striking bend, under 135° E. long., to the south-east, resuming as it flows at some distance from the coast up to Yokohama its old north-east direction. Under the 38th parallel east of Cape Kinkuasan, the Kuro-Shiwo strikes the Oga-Shiwo, i. e. the cold Kurile current from the north. The observations of ships in this region show that often in a few hours the temperature of the water falls 20° and 30° , and the temperature of the air also; the weather becomes cold, muggy, and rainy, and the colour of the water changes from the blue or blue-black of the tropics to the well-known bottle-green. The boundary line between the Kuro-Shiwo and the Oga-Shiwo, from February to April inclusive, is under 38° lat. and 143° to 145° long.; in May, under 42° and 147° ; in July, under 45° and 150° ; and in August, lies north of 50° lat. The polar current here does not extend at any time below 38° . The analogy between the Pacific and Atlantic in this respect is almost complete. The Oga-Shiwo is the Pacific Labrador current, and Cape Kinkuasan plays the part of Cape Race, except that the latter lies 10° further north than Cape Kinkuasan. After meeting the polar stream, the Kuro-Shiwo turns east, but Dr. Schott does not follow it in its further course. Running parallel and to the east of the Kuro-Shiwo is a second though less important warm stream, called the Bonin current, which comes from the south and flows in a north, north-east, and then E.N.E. direction. At 130° E. long. it flows east in a course which former maps showed as the course of the Kuro-Shiwo. The Bonin current does not always flow to the west of the Bonin Islands; its mean axis of movement varies with the season of the year, and at the end of summer lies to the east of the Bonin Islands. In this case also there is an analogy with the phenonema of the North Atlantic, as Krümmel's investigations have showed that east of the Antilles and of the Florida current there flows a broad though not intensive stream in a similar direction. Dr. Schott discusses the influence of the winds upon these currents, and gives some important information with regard to currents in the Straits of Formosa and the Yellow and Japan seas. The second part of his article is devoted to water temperatures in these regions.

The Position of Khotan.—M. Dutreuil de Rhins, who is at present in Khotan where he means to pass the winter, has determined provisionally, after calculating part of his 126 observations of Jupiter's satellites, the astronomical position of the town. He makes it to be $37^{\circ} 6' 35''$ N. lat. and $77^{\circ} 55' 14''$ E. long. Its altitude is 4639 feet. He hoped to reach Polu by the middle of August. He left Osh on the 23rd May, and travelled viâ Kashgar over the Tian Shan along the Surchab.

An Ascent of the Volcano Ollagua.—There is an interesting account, published in part x. of Petermann's 'Mittheilungen,' of an ascent of the volcano Ollagua, a lofty peak situated on the frontier line between Chile

and Bolivia, which had not been ascended by any European. M. Hans Berger, who made the ascent, was engaged from 1887 to 1890, as engineer, in superintending the extension of the Antofagasta-Calama line of railway from the latter point to Huanchaca. It was while constructing that portion of the line which skirts the mountain of Ollagua that he accomplished the ascent (September 1888). The geographical position of Ollagua is somewhat uncertain, and, for want of proper instruments, M. Berger was unable to more precisely determine it. The peak lies in about $21^{\circ} 20'$ S. lat. and $68^{\circ} 10'$ W. long. Its altitude was trigonometrically measured by M. Berger, and found to be 19,198 feet; the crater of the mountain lies at about 18,000 feet. Ollagua is a mountain mass rising, without any important outlying spurs, from the vast desert pampas surrounding it; these pampas are themselves about 12,000 feet above the sea level. It is curious that the crater does not lie on any one of the five rocky points into which the summit is divided, but upon the steep slope to the west. In addition to the crater which is now active, there were formerly several other crater-openings, the most important of these being the so-called Porunna, a mountain in shape like a truncated cone, situated about six miles to the west of the present active crater, and rising only about 1150 feet above the pampas. A preliminary excursion was first made up the slopes of the mountain to a height of 15,300 feet, where important sulphur deposits were discovered, which showed evident traces of a former working, probably by Bolivian natives. These sulphur deposits were found in a series of rocky clefts, from 50 to 100 yards apart, inside which a layer of sulphur crystals varying in thickness from $3\frac{3}{4}$ to $7\frac{1}{2}$ inches had been formed. The ascent to the crater was made on the 15th September. Starting at 5.30 a.m. the party proceeded on mules up to the spot visited on the former occasion, which was reached about 10 o'clock. Here the mules were left. At this point there is a belt of more or less level ground, about 500 yards broad, which extends round the mountain, and which, strange to say, boasts of a vegetation, and thus stands in strong contrast to the desert plains below. The stony sandy soil is covered in places with a stiff dried-up grass, which grows as high as six feet; here and there are trees somewhat resembling a Scotch fir, the stunted resinous branches of which attain a height of 10 or 12 feet; several specimens of the columnar cactus, not uncommon on the high table-lands of Bolivia, were observed. With regard to the fauna, a species of field-mouse, beetles and other small insects, and viscachas—a kind of wild rabbit—were observed. The ascent was continued over steep sandy surfaces, across several deep ravines, and then over rocks. About 3 p.m. the party reached, at a height of 17,575 feet, a steep slope, which was covered with snow and ice, and which showed traces of glacier formation and of eternal snow. The thermometer registered 21° F. The snow was not deep, owing doubtless to the infrequency of snowfall in this region and

to the power of the direct rays of the sun. After crossing the snow-fields, and climbing, with difficulty, a wall of rocks, about 300 feet high, M. Berger arrived at the crater. The crater is not of the usual more or less circular shape, but consists of numerous fissures and spalts in very rocky ground. From these narrow openings a white steam of sulphur and water was issuing with great force and with a roaring noise. All the rocks which in strange shapes surround the crater are completely covered with light yellow sulphur crystals. From the largest rocky fissures sulphur also, in the form of a semi-fluid pap, was discovered to be issuing. No lava was found, and no smoke except the white sulphur steam. M. Berger supposes that when the sulphur stored up in the interior of the mountain, and which is given off as indicated above, becomes exhausted, the activity of the volcano will cease; possibly, before that time, the clefts in the rocks will have been closed up by sulphur crystals in the same way as those met with lower down the mountain. Two photographs of the crater were obtained. The descent was rapidly accomplished.

Obituary.

Captain William Chimmo, R.N.—We regret to hear of the death of our much-respected colleague, Captain W. Chimmo, which event occurred at his residence, Westdowne, Weymouth, on the 30th of October last. Captain Chimmo had distinguished himself in his time by the interest and value of the scientific observations, both physical and biological, which he made during the various surveying expeditions on which he was employed, for a long series of years, by the Hydrographical Department of the Navy. Papers on these objects and *resumés* of official reports were contributed by him from time to time to our Society, and were published in the 'Journal' and 'Proceedings.' The first was an account of his voyage, in 1856, from New South Wales along the northern and north-western shores of Australia to the mouth of the Victoria River, which he contributed to the 'Proceedings' (old series), vol. i. p. 255. A second paper was entitled a "Visit to the North-East Coast of Labrador, during the autumn of 1867," and was published in the 'Journal,' vol. xxxviii. p. 258, illustrated by a chart of the 300 miles of coastline which he then surveyed, in H.M.S. *Gannet*. Subsequently, in the 'Proceedings,' vol. xii. p. 92, was published a paper giving an account of the deep-sea soundings and temperature and biological observations made by him in the Gulf Stream, in 1868; and in 1871 ('Proceedings' vol. xv. p. 384) a description of the curious volcanic island of Cayagan Sulu, off the north coast of Borneo. He also published, as separate works, the 'Voyage of H.M.S. *Torch*, from Sydney to the Gulf of Carpentaria and Batavia' (London, 1857), and the 'Natural History of the *Euplectella aspergillum* (Venus' Flower Basket), from the Philippine Islands,' with plates (1878).

Captain Chimmo entered the Royal Navy in 1841. As midshipman he saw hard service in the first Chinese war, and was present in the operations on the Canton River, and at the capture of Wu-Sung, Cha-pu, and Chiang Kiang-fu. He served in the *Herald* (Captain Kellett) during great part of the surveying voyage of this

vessel in the Pacific and along the west coast of America to Behring Strait, between 1845 and 1851, passing his examination in seamanship in January 1848, and becoming acting-mate, and afterwards acting-lieutenant of the *Herald*, and in 1850 was promoted to the rank of lieutenant. In 1852 he was appointed to the command of the steam vessel *Torch*, employed in the survey of the Fiji Islands and Western Pacific. In 1856 he received his appointment for special service to the *Juno* (Captain S. G. Fremantle), during which he carried out the search expedition to the north-western coast of Australia already mentioned. In May 1858, he commanded the *Seagull*, gunboat, tender to the *Porcupine*, and was employed on the survey of the north-western coast of Scotland; serving afterwards for some two years on shore in the Hydrographical Department. Receiving his promotion as commander in 1864, he was employed in the following year on the North American and West Indies station, in command of H.M.S. *Gannet*, auxiliary surveying vessel, in which he conducted with ability and success the coast survey of Labrador, already alluded to, and the surveys of the Island of Trinidad and the Bay of Fundy, subsequently investigating the Gulf Stream and carrying a line of deep-sea soundings across the Atlantic, of which mention has already been made. In 1868 and the two following years, in command of the *Nassau*, he was engaged in exploring the islands of the Eastern Archipelago and the Sulu Sea, and in 1870 examined the Red Sea with a view to selecting sites for lighthouses. On completing this work he carried a line of deep sea soundings from Ceylon to Java, and thence up the China Sea to Hong Kong, and afterwards surveyed the western part of the Sulu Sea and the channels thence to the Celebes Sea.

He retired from active employment, with the rank of captain, in October 1873. His long-continued and eminent services have gained for him a high position in the records of the scientific branch of the Navy, which contains the names of so many illustrious officers. He had been a Fellow of our Society since 1857.

Captain Thomas Wright Blakiston, R.A.—The Society has lost one of its most distinguished members by the death of this adventurous and competent traveller, who gained considerable reputation thirty years ago by his survey of the middle and upper course of the Yang-tsze-kiang, from Yo-chau to Ping-shan. The survey, it will be remembered by those who keep themselves informed of the progress of Chinese geography, was accomplished during the journey, famous in those days, of Lient-Colonel Sarel, Dr. Barton, the Rev. S. Schereschewsky, and Blakiston, in 1861. He died, as we are informed by his brother, Mr. Matthew Blakiston, F.R.C.S., on the 15th of October last, at San Diego, on the coast of California, at which health resort he had arrived only a few days previously from his residence in New Mexico.

Captain Blakiston was born at Lymington, Hants, on the 27th of December, 1832. He received his education at St. Paul's School, Southsea, whence in due course, in December 1851, he entered the Royal Military Academy, Woolwich. Having completed his training he received a commission in the Royal Artillery, and served in England, Ireland, and North America until his battery was ordered for the Crimea, in the spring of 1855. Here he remained, serving in the operations before Sebastopol, until the fall of that fortress. When the Palliser Expedition was organised for the purpose of exploring the country lying between Canada and the Rocky Mountains, he was appointed, at the instance of the Royal Society, and on the recommendation of Sir Edward Sabine, a member of the expeditionary party, charged with the duty of conducting the magnetic, temperature, and other observations. He was occupied during the autumn and winter of 1857-8 in the Hudson's Bay Territory and in Western Canada. When the expedition moved on towards the Rocky Mountains in the following summer (1858), he ascended and

crossed the range independently of the rest of the party, by the Kutanie Pass, which had been previously crossed also by Captain Palliser and the remainder of the expedition. Captain Blakiston carried out a line of levels over the Pass and returned by the Boundary Pass, the chief part of which lies in American territory. He published an account of this journey at Woolwich in 1859, under the title of a 'Report of the Exploration of two Passes through the Rocky Mountains in 1858.'

Returning from America, he was ordered with his battery to China in the last Chinese war, and served with it at Canton. After the war, in 1861, he organized the expedition for the exploration of the Yang-tsze, of which mention has already been made. The object of this expedition was to ascend the great river as far as its northern tributary the Min, and then cross the Province of Sze-chuen to its capital, Ching-tu, and, obtaining passports from the Viceroy for Tibet, to cross into Tibet via Ta-tsien-lu and so proceed to Lhasa and North-western India. The unsettled state of the country in the west prevented the party from carrying out this ambitious programme. They reached, however, Ping-shan, beyond the mouth of the Min, a distance 900 miles further than had previously been reached by Englishmen, and brought back a rich store of geographical and other information. For his admirable survey of the river, the map founded on which was published in the 32nd volume of the Society's 'Journal' (p. 1), he received, in person, in 1862, the Royal (Patron's) Medal. Narratives of the expedition were published in the same volume of the 'Journal' by Lient.-Colonel Sarel and Dr. Barton. A popular account of the journey was soon after published by Captain Blakiston himself, under the title of 'Five months on the Yang-tsze, with a narrative of the exploration of its upper waters; illustrated by A. Barton' (London, 1862).

On the return of the Yang-tsze Expedition he made a short visit to Japan, and proceeding then to England he resigned his commission in the artillery and went out to Japan to settle in the country, travelling by way of Russia, Siberia, and the Amur. Fixing his residence at Hakodate, in Yezo, where he soon became its most popular resident, he founded saw mills, with the intention of establishing a trade in sawn timber, profiting by the great primitive forests of the island and the demand for timber in China. Although his objects in this were frustrated by the opposition of the Japanese Government, he remained at Hakodate as a merchant for many years. During this time he made extensive journeys in this, at that time, almost unknown island. A paper of considerable length, full of information regarding the topography, climate, forests, fisheries, and coal-mines, and the condition of the Japanese colonists and aboriginal Ainos, was contributed by him to our Society in 1872. The paper gave a narrative of a journey he had made by land over nearly the whole circuit of the island, and was read for him at an evening meeting by the late Sir Harry Parkes, being afterwards published in the 42nd volume of the 'Journal.'

He finally left Japan in 1884, and after a short stay in England proceeded to the United States, settling at length in New Mexico. Although chiefly distinguished as an adventurous and observant traveller, he was also known in biological circles as a naturalist of merit; ornithology was his favourite branch, and on this fascinating subject he frequently contributed papers to the Natural History Journals. For some time he was an active correspondent of the Zoological Society, to the gardens of which in Regent's Park he sent living animals. According to a well-informed writer in the 'Japanese Gazette,' he also published a work entitled 'Japan in Yezo,' giving a summary of his experiences during his twenty years' residence in the island—a work which, in the writer's opinion, is the most trustworthy account that has yet been given of Yezo. It was Blakiston who first drew attention to the existence of pit-dwellers—a pre-Aino race—in Yezo. The main portion of the collection of birds made in the island he presented to the Hakodate Museum.

Henry Nottidge Moseley.—Our Fellow, Prof. Moseley, who died on November 10th, was the son of the late Rev. Henry Moseley, F.R.S., Canon of Bristol. He was born at Wandsworth on November 14th, 1844, and was educated at Harrow and Downing College, Oxford. He afterwards studied medicine at London, Vienna, and Leipzig. In 1871 Mr. Moseley served as a member of the English Government Eclipse Expedition to Ceylon and Southern India. In the autumn of the following year he was appointed one of the naturalists to the *Challenger* Expedition, which he accompanied during the entire voyage, till May 1876. One of the most interesting outcomes of that great expedition was Mr. Moseley's 'Notes by a Naturalist on the *Challenger*,' published in 1879. These notes cover a wide variety of subjects, geographical, ethnological, biological, and physical. They show Mr. Moseley to have been a keen observer and a cautious and sound reasoner, imbued with the true spirit of Darwin. They are full of suggestion, and ought to be studied by every traveller who desires to have a practical example of "How to Observe." On Mr. Moseley's return he was elected Fellow of Exeter College, Oxford, where he resided for about three years, working out some of the scientific results of the expedition and preparing the work just referred to. In 1879-81 he acted as Assistant-Registrar to the University of London. In 1881 he was elected to the Linacre Professorship of Human and Comparative Anatomy at Oxford, the duties of which post he actively fulfilled till about five years ago, when ill-health compelled him to give up work for a time; though as a matter of fact he was never able to resume his duties. Mr. Moseley was not only an admirable teacher, but undoubtedly had an inspiring influence upon his students. His disinterested devotion to his duties, and the neglect of rest and recreation, had much to do in bringing about the serious illness that compelled him to retire. In 1877 he was elected Fellow of the Royal Society, and in 1884 was President of the Biological Section of the British Association, which then met in Canada; Mr. Moseley there received the degree of LL.D. from the McGill University. In 1878 he published a small work on 'Oregon, its Climate, Resources, People, and Productions.' To the 'Proceedings' of the Royal and other Societies, as well as to the scientific journals, he contributed many papers, giving the results of his numerous original researches in biology. To the *Challenger* series of Reports he contributed the Memoirs on the Hydroid, Alcyonarian, and Madreporan Corals collected during the voyage.

Mr. Moseley took a real interest in Geography, and especially in Geographical Education. He had much sympathy with the reform movement of the Society, and the Council on more than one occasion applied to him for advice. He gave one of the lectures in connection with the Society's Educational Exhibition, January 24th, 1886, the subject being the Scientific Aspects of Geography, in which he showed that even from the scientific point of view there was a distinct field for geographical as apart from geological research.

Unfortunately, as has been stated, some five years ago Mr. Moseley was compelled to give up all work, and his death is a loss to geography as well as to other departments of science. In 1881 he married the youngest daughter of Mr. Gwyn Jeffreys, F.R.S.

REPORT OF THE EVENING MEETINGS, SESSION 1891-2.

First Meeting, 10th November, 1891.—The Right Hon. Sir M. E. GRANT DUFF, G.C.S.I., &c., President, in the Chair.

ELECTIONS.—*George Percival Baker, Esq.; David John Collins, Esq.; Capt. Francis P. Fletcher-Vane (late Scots Guards); Gaston Vincent de La Castide, Esq.; Gwyn Morris, Esq.; Lieut. Charles George Nurse (Indian Staff Corps); James Reed Pardy, Esq.; J. Goldsmith Procter, Esq.; Frederick Pine Theophilus Struben, Esq.*

The paper read was:—

"Recent Journey through the Trans-Salwin States to Tong-king." By Lord Lamington.

The paper was illustrated by a series of photographic slides, projected on the screen by means of the dioptric lantern, and representing views in Siam and Tong-king. After the paper an exhibition, chiefly of Siamese works of art and manufacture, kindly lent by Mr. W. J. Archer, was held in the Tea-room.

Before introducing Lord Lamington to the meeting the President congratulated the Society on the auspicious opening of the new Session, and announced that a larger number of new Fellows had that day been proposed for election than at any previous meeting of the Society.

Second Meeting, 23rd November, 1891.—The Right Hon. Sir M. E. GRANT DUFF, G.C.S.I., President, in the Chair.

ELECTIONS.—*Frederick Adcock, Esq.; Samuel Hewett Agnew, Esq.; Lieut. B. F. S. Baden-Powell (Scots Guards); J. Augustus Bauer, Esq.; F. Thorp Becker, Esq.; Henry Hesketh J. Bell, Esq.; C. E. Biddulph, Esq., M.A.; Walter John Blanchard, Esq.; Rev. James Barnes Brearley, M.A.; John Russel Buckler, Esq.; Charles Burland, Esq., M.D.; D. A. Cameron, Esq.; Edwin George Cammidge, Esq.; Lieut. John Casement, R.N.; Thomas Alfred Cox, Esq.; Walter Robert Cuthbertson, Esq.; Karl van Damme; James Robert Dickson, Esq.; James Archibald Douglas, Esq., M.A.; Denis Doyle, Esq.; George Herbert Eccles, Esq.; Frederick John Elliot, Esq.; Capt. W. T. Fairbrother (Bengal Staff Corps); William Frederick Foster, Esq.; Rev. Frederick John Gibbings; Alexander Glen, Esq.; Sydney Goldmann, Esq.; Lieut. Philip James Gordon (Indian Staff Corps); Henry Lawrence Hammach, Esq.; Henry H. Hayter, Esq., C.M.G.; Horace Augustus Helyar, Esq., M.A.; Henry John Hemmy, Esq.; Thomas Hennell, Esq.; Charles E. Ingham, Esq.; Norman Parr Jaffrey, Esq.; Llywellyn Jones, Esq.; William Herbert Jones, Esq.; John William Laing, Esq., M.A.; Capt. J. R. L. Macdonald; Arthur Marcel, Esq.; Capt. F. R. Maunsell, R.A.; Hugh Robert Mill, Esq.; Robert Jarratt Money, Esq.; William Edgar Munty, Esq.; The Duke of Newcastle; John Lowe Nicoll, Esq.; Edwin Stephen Passmore, Esq., M.B.; Andrew Pears, Esq.; Sir John Dickson Poynder, Bart.; Julius M. Price; Capt. O. W. Pringle, R.E.; Rajoelson (Grandson of H.E. the Prime Minister of Madagascar); Walter Ernest Rees, Esq.; Robert Reid, Esq.; Francis Hansard Rivington, Esq.; Hon. Walter H. Ruthven (Scots Guards); John Gervais Skipton, Esq.; H. A. Spalding, Esq.; Hon. Edward Stanley; Rev. Claude Hope Sutton; Lieut. Percy M. Sykes; William Henry Tagart, Esq.; John Christopher Toller, Esq.; Arnold H. Ulyett, Esq.; John William David Vaughan, Esq.; J. E. Matthew Vincent, Esq.; Count Axel*

Waditmeister; *Rev. John H. Weeks*; *Percy Charles E. D'E. Wheeler, Esq.*; *Percy Whitehead, Esq.*

The paper of the evening was, "A Journey across the Pamir from north to south," by St. George Littledale.

Will be published, with map, in a subsequent No. of the 'Proceedings.'

PROCEEDINGS OF FOREIGN SOCIETIES.

Geographical Society of Berlin.—October 10th, 1891: Dr. W. REISS in the Chair.—Dr. Bässler read a paper on a short visit made by him to Achin (Sumatra). In consequence of the continued and obstinate resistance which the Achin people are making to the Dutch, and also because of the enormous loss of life caused every year among the Dutch troops by the "Beriberi" disease, the Dutch have recently adopted a defensive rather than an offensive position with regard to their foes. In place of military governors, civil officials have been appointed, and efforts are being directed to preserving the territory already acquired, rather than to framing schemes for fresh conquests. Many of the earlier forts, called "Bentings," have been given up, and the rest are being re-built in accordance with the present requirements of hygiene. Airy barracks, behind stout fences, are being constructed of boards and wire-work; every place has its well-appointed hospital; trenches surround the fortified positions; artillery is mounted on the elevated bastions, and powerful dark-lanterns illumine the foreground in the night. The writer visited the towns of Analabu and Oleh-leh, and travelled from the latter place by the short line of railway (10 minutes) to Kota-Radja, the former capital of the Sultans of Achin, which also contains the sacred tombs of the sultans. These tombs are the goal of many Achin pilgrims, who are allowed admittance by the Dutch Government at any time on a permit. It is indicative of the unsettled condition of the country that the windows of the carriages of the little railway above-mentioned are made of steel-plates with air-holes, because shots are very frequently fired upon the trains; even the intercourse of the Dutch with the so-called "allied" Achin villages is uncommonly guarded. It is only under a strong escort, and after adopting the strictest precautionary measures, that the Dutch officials venture to set foot even for a short time in the neighbouring "Kampongs" of the allied chiefs, who are sometimes decorated with Dutch orders. These allied villages are in their turn, in consequence of their more peaceful and friendly disposition, in constant danger of being attacked by their own countrymen, who are always at war with the Dutch. They are therefore strongly fortified; day and night sentinels from watch-towers are on the look out for an approaching enemy, and often each house in the village is specially fortified. Finding that the so-called allied Achin people already exhibit in their mode of life a considerable veneer of civilization, and that every attempt to penetrate into the interior resulted in failure, Dr. Bässler quitted, after a few days, this inhospitable country, which presented no field for his ethnological studies, and where a blow with the *klewang*, delivered with unerring aim, has already spared many a European the return journey to Europe.

Dr. E. von Drygalski then spoke upon his expedition to Greenland in the summer of 1891. The inland-ice and glaciers of Greenland present the nearest comparison to the conditions which must be supposed to have prevailed in the most recent geological time over the greater part of Germany, when the Scandinavian glaciers extended as far as the Hartz and Riesengebirge. If one desires to investigate

more closely the circumstances under which the movement of such enormous ice-masses took place, one must, in order to a successful inquiry into this subject, make one's studies not on the small glaciers of the Alps, but on the glaciers of Greenland, which stand in direct connection with the great ice-covering (130,000 square miles) of the interior and in their movement, which reaches a velocity, unheard of in the Alps, of 35, 70, and even 100 feet a day, are indicative of the force of the inland ice itself. The principal task of the expedition was to investigate the conditions of movement of the ice-masses of Greenland and their main physical features for one year. But because it was impossible to transport, during the present year, in the vessels of the "Greenland trade" which from Copenhagen carry on the commerce with the colony, the complete equipment necessary for wintering in the polar regions, and inasmuch as it appeared desirable to first of all come to a decision on the spot as to the point at which a station should be established, it was decided to despatch a preliminary expedition for this purpose in the summer of 1891. This expedition sailed from Copenhagen on the 3rd May, and on the 16th June reached Jacobshavn. The intention was to travel from here across the ice-fjord to Claushavn and then to reach, via Tasnisak, the great Jacobshavn glacier. But this proved to be impracticable, because all the fjords were choked full of ice. An attempt had therefore to be made to reach the glacier overland from the north. From the visit to the glacier it was ascertained that the edge of the glacier had not shifted to any considerable extent since Hammer's measurements in September 1879. On the 20th June the expedition set out from Jacobshavn and proceeded by way of Ritenbenk through the Vaigat to the Umanak fjord, and arrived at Umanak on the 29th June. From this point the party made their way to the little settlement of Ikérasak, situated in the interior of the fjord, whence different excursions were undertaken to the Sermilik, the Karajaks and the Itiodlilarsuk fjords almost up to the limit of the inland ice. The Store Karajaks Isbræ was determined upon as the best place for the station to be erected in the year 1892. On the 29th July the return journey from Umanak was commenced, and on the 18th September Copenhagen was reached.

— November 7th, 1891: Dr. W. REISS in the Chair.—The result of the election of the President and Vice-Presidents for the year 1892 was that Baron von Richthofen was chosen as President, Lieut.-General Tallbach as first Vice-President, and Professor Hellmann as second Vice-President.—Professor Förster, head of the Berlin Observatory, spoke upon the International Geographical Congress held at Berne, and particularly upon the negotiations with reference to the unification of the hour and to the initial meridian. These negotiations have led to no direct result; but the matter will be further dealt with by a Commission of the various Governments which is to be called together at the instance of the Swiss Federal Government. It appears that in the matter of the initial meridian there will be no progress to be chronicled until the countries speaking the Anglo-Saxon language condescend to the introduction of the metric system. But inasmuch as the English Government has declared that it possesses no legal means of compelling the introduction of the metric system of weights and measures in England, one must be content with the expression of the wish that it may be possible, in the first instance, at least for English men of science and technologists to voluntarily bring the metric system into use. Professor Förster added to these observations some comments upon the value of scientific congresses generally. The latter appear to have been a failure, when they, so to speak, have not proceeded properly from the state of infancy to that of manhood. These congresses must concern themselves with something more than lectures and speeches; they must aim at securing tangible results—results which, to be sure, involve the expenditure of money. As examples of such international

scientific congresses he instanced those for international weights and measures, for earth-measurements, and for astronomy, which, he said, could look back upon important practical results. The first step towards a like result had perhaps been taken by the Berne Congress by its vote with reference to the preparation of a map of the world on the scale 1:1,000,000 in accordance with Professor Penck's proposal. On the other hand, the attempt of the Congress to regulate the correct spelling of geographical names must be regarded as a failure, in face of the fact that such resolutions are dependent entirely upon external circumstances and accidental majorities, and therefore are never generally accepted.—Professor Schweinfurth then spoke upon the similarity of the floras of North Abyssinia and South-west Arabia. The speaker gave the characteristics of the geological, topographical, and climatological conditions of both these regions, and stated as his conclusion, based upon his own botanical explorations and those of his predecessors, that the flora of Yemen resembles in the main that of Erythraea. The differences are found more in the cultivated plants than in those growing wild, and that in the climatological conditions, especially rainfall, lies the explanation of the fact that certain typical plants for both countries descend about 650 feet lower from the terraces of the highlands of Yemen than from the mountains of North Abyssinia.

NEW GEOGRAPHICAL PUBLICATIONS.

(By J. SCOTT KELTIE, *Librarian* R.G.S.)

EUROPE.

Buchanan, J. Y.—On the Composition of some Deep-Sea Deposits from the Mediterranean. [From 'Proceedings of Royal Society of Edinburgh,' Session 1890-91.] 8vo. [Presented by the Author.]

[**Caucasia.**]—Kovalefsky, Maxime.—*Zakon i obychai na Kavkazé.* 2 vols., Mosco, 1890: pp. vii. and 304, and ix. and 290.

Law and custom in the Caucasus. In this work M. Kovalefsky gives the results of his further studies and researches in the customary law of the mountaineers of the Caucasus. In part i. of vol. i. he treats of the elements of tribal organisation, and their influence on popular customs; in part ii. he discusses external influences, whether Persian, Greek, Roman—Byzantine, Christian, Armenian, Arab, Khazar, Hunnish, Tartar, Mongol, Kabardinian, and lastly Russian. The second volume refers to the inhabitants of Mingrelia, Georgia, and Daghestan.

M. Kovalefsky brings great learning and breadth of view to bear on his subject, illustrating his remarks by references to works of travel.

[—] *Sbornik materialov dia opisaniya mestnostyeh i plemion Kavkaza.* Parts 10 and 12. Tiflis, 1890.

Collection of materials for the description of places and tribes in the Caucasus, edited by the Educational Department of the Caucasus. Contains a geographical sketch of Suanetia; characteristics of the Suanetians; their religious and moral condition; brief notices of certain localities; proverbs and poetry of the Suanetians, their songs, tales, and legends; Mingrelian songs, proverbs, and tales; and lastly Georgian traditions and tales. All these have been reduced into writing and translated into Russian by various collectors, and should afford abundant materials for the lover of folk-lore. Part 12 contains an ethnological map of Kabarda, to which country it refers.

[—] Gan, K.—*Isvestiya drevnikh Grecheskikh i Rimskikh pisatelei o Kavkazé*. Notices of ancient Greek and Roman authors on the Caucasus, collected and translated from originals. Part I. From Homer to the 6th century. Tiflis, 1884: pp. 248. Edited under the auspices of the Educational Department of the Caucasus.

[—] Lopatinsky, L.—*Russko-Kabardinsky Slovar s Ukazatelem i Kratkoyu grammatikoyu*. Russo-Kabardinian Vocabulary. Published by the Educational Department of the Caucasus. Tiflis, 1890: pp. 299. [Presented by Privy Councillor Janoffsky, Curator of the School Arrondissement of the Caucasus.]

The Kabardinian language is spoken by the inhabitants of Greater and Lesser Kabarda, in the south-western part of the oblast (arrondissement) of Terek. M. Lopatinsky in his preface says that it is a dialect of the *Adighei* or *Cherkess*, and has remained unchanged, the Kabardinians having emigrated *en masse* to Turkey to avoid the consequences of the war which closed in 1864 by the subjugation of all the tribes of the Caucasus by Russia. This dialect or language has no literature, the first attempts to reduce it to writing by means of the printing press having been made by Kazi Atajukin, under the direction of Baron Uslar, in 1864. The present work has derived great benefit from the co-operation of cultivated Kabardinians, while Professor T. E. Korsch, of the Mosco University, has contributed invaluable service to the author by indicating the words derived from the Turko-Tartar, Arabic, and Persian languages.

[—] Uslar, Baron P. K.—*Etnographiya Kavkaza*. Ethnography of the Caucasus. Philology, part iv. The Lak Language. Published by the Educational Department of the Caucasus. Tiflis, 1890: pp. 442 and 14. [Presented by Privy Councillor Janoffsky.]

In this fourth part of the works of the late Baron Uslar are included (1) his letters to the late A. A. Schiefner; (2) the Lak language (grammar, examples of the language, and vocabulary); and (3) the Kazi-Kumukh alphabet. In one of his letters to Schiefner, in May 1864, the author says, "The Kazi-Kumukh grammar, or as I call it after the native fashion for the sake of brevity, the Lak grammar, is now ready, and extends to greater dimensions than the Abkhasian." He began printing it in 1865, and finished it the same year. In April 1866 Schiefner read a communication on the work before the Academy, and appears to have done much towards reducing Baron Uslar's notes into order. The Kazi-Kumukh (Laks) inhabit parts of the oblast (arrondissement) of Daghestan, and number altogether 48,492 of both sexes, inhabiting 91 auls or villages.—[E. D. M.]

Fischer, Andreas.—*Zwei Kaukasus-Expeditionen*. Bern, 1891: 8vo., with illustrations and map.

The author of this unpretending volume, a Swiss schoolmaster, the brother of one of the guides who perished with Mr. Donkin and Mr. Fox in the Caucasus in 1888, was taken out by Mr. Dent and Mr. Freshfield in the following year as a member of their search party. He here gives an account not only of the search already recounted by Mr. Freshfield in these pages, but of the rest of the journey from Vladikavkaz to Urusbieh along the north side of the chain, hitherto undescribed. His narrative is clear and straightforward, simple and graphic, and might be imitated with advantage by many climbers. Particularly striking are the descriptions of the writer and Mr. Freshfield toiling up for hours through a thick fog, to burst suddenly into an upper world of dazzling blue and white on the Mishirgi Glacier, and the descent of a rockwall above the Saluinan Chiran Glacier, where the party were exposed for several hours to grave peril from falling stones. Herr Fischer records that the citizens of Vladikavkaz assured him and the Swiss guides that the party of the previous year had been murdered, and that they would be too by the mountaineers. This circumstance, perhaps, explains the otherwise unaccountable depression in their companions noticed

by the English travellers! It is noteworthy, also, that the Jew interpreter inquired "if Englishmen often struck Jews," and "became a different man" on receiving an assurance to the contrary. Mr. Woolley's photographs have been used to illustrate the narrative.

Richter, E.—Geschichte der Schwankungen der Alpengletscher. (Separatabdruck aus der Zeitschrift der Deutschen Oesterreichischen Alpenvereins 1891, Band XXII.) Wien, 1891, pp. 74.

This pamphlet deserves particular study from all who are interested in glacial science. It is by far the most complete, the most orderly, and the most conclusive statement of the historical facts that have been collected by the minute industry of many observers and compilers—amongst whom Professor Forel has been the leader—as to the oscillations of the Alpine glaciers during the last three centuries. It is, perhaps, too much to hope that it will put an end to the credulity which from time to time manifests itself in the press and elsewhere with respect to the legends of the comparatively small extent of the Alpine ice within historical times. But it ought at any rate to satisfy the scientific world that the writers who have discredited these legends have done so on conclusive historical as well as physical evidence. For the details of this evidence readers must go to Dr. Richter's pages. We can only recapitulate the results of his investigation, which he sums up as follows:—

1. Periods of glacial advance recommence periodically at intervals of from twenty to forty-five years, the average for the last three centuries being exactly thirty-five years. (Between each period of advance there is of course one of retreat, commonly about equal, so that the length of the periods of advance may be taken as half that of the interval between their recurrence.)

2. These advances are not of equal rapidity, nor do they proceed altogether regularly. The rapidity of an advance during the same period is not the same with all glaciers. Some glaciers have attained their greatest known extent in one period, some in another.

3. A not infrequent phenomenon seems to be the absence, at any rate to the casual observer, in the history of some glaciers of certain single periods; in other words a retrograde or progressive movement may be so faintly indicated as to be overlooked between the movements in an opposite direction of the preceding and the following period.

4. The glacier movements of the last three centuries coincide in the main with the climatic periods determined by Brückner.* The advance of the ice manifests itself *during* the period of wet and cold years, so that the advance of the glaciers follows more quickly on the climatic conditions that produce it than has hitherto been assumed.

5. No earlier commencement of the period of advance in one part of the Alps as compared with another is recognisable in the earlier periods (before 1880), taking into account the fact that the glaciers of the Western Alps, from the greater steepness of their beds, move the most rapidly, and, therefore, the advance is sooner registered by a forward movement of their lower extremities.

6. It is a popular belief in many parts of the Alps, that the glaciers were formerly of less extent and the passes more practicable than at present. Careful investigation shows, however, that (a) some of these accounts involve such extensive alterations of the glaciers as could not have taken place without corresponding changes in the vegetation and productions of the Alpine countries, which could not have escaped our notice through the historical records; (b) in a large number of cases, glacier changes of no more than the extent now recurring would account for the increased impracticability, as on the Col de Fenêtre, Monte Moro, and elsewhere.

7. Not one single authentic notice exists, which would lead us to assume that in historic times, before the sixteenth century, the glaciers of the Alps have been (for any length of time) smaller than they are now; the popular tradition

* 'Klimaschwankungen seit 1700,' von E. Brückner. Wien, Hölzel, 1890.

above referred to must rather be considered to have arisen from recollections of the regular glacier movements, and the consequent changes in the practicability of the passes.

Dr. Richter might have fortified his argument by a reference to other chains. One of the reasons for the abandonment of high glacier passes is the construction of good roads. Then the proverb "the longest way round is the shortest way there" is practically applied. Other reasons for a decline of adventure among business travellers are the extinction of freebooters or petty warfare, and the abolition of local taxes or dues exacted by petty states or chiefs. Those who have known the Caucasus for the last quarter of a century, have seen with their own eyes the transition taking place, and been able to appreciate its true causes. Even as to legends the parallel holds good. In one place (Ceja Valley, Adai Choch Group) there is said to have been a frequented pass where a pass in the ordinary sense of the word would, even without glaciers, be, owing to the nature of the ground, a physical impossibility.

The upshot of the whole matter seems to be that, as far back as historical records exist, temperature and moisture in Europe have been somewhat irregularly oscillating within moderate limits at unequal intervals, and that the glacial movements have followed closely, like clock-hands, on these oscillations, but that there has been no appreciable variation in the average climate or consequently in the glacial extension—[D. W. F.]

Russian Geographical Society. Programma dia sobiraniya narodnikh yuridicheskikh obychaev. Programme for the collection of national juridical customs. St. Petersburg, 1889: pp. ix. and 81.

Contains a number of questions intended to serve as a guide to the ethnologist specially inquiring into jurisprudence. These are grouped under the several heads of civil and criminal law and the administration of justice.—[E. D. M.]

Sella, Vittorio.—Nel Caucaso Centrale colla camera oscura. Torino, 1891: 61 pp., with panoramas and illustrations. (Extract from the 'Bolletino del Club Alpino Italiano'.)

This is a terse account, full of accurate new and interesting information, of the journey of which the photographic results have been shown in the Society's rooms. The author describes both people and scenery with insight and appreciation. Some fair—only fair—reduced reproductions of his photographs serve as illustrations. The series would have been more complete if a few views of the great forests had been included. The close juxtaposition of forests and glaciers is the distinctive mark of the finest Caucasian scenery.

Wahnschaffe, [Dr.] Felix.—Die Ursachen der Oberflächengestaltung des Nord-deutschen Flachlandes.—Forschungen zur deutschen Landes- und Volkskunde . . . herausgegeben von Dr. A. Kirchhoff. Sechster Band, Heft 1. Stuttgart, J. Engelhorn, 1891: 8vo., pp. 166, illustrations.

Wolff, Henry W.—The Country of the Vosges. London, Longmans & Co., 1891: 8vo., pp. xiii. and 368, map. Price 12s. [Presented by the Publishers.]

So scanty is our literature, with the exception of guide-book information, on the Vosges country, that the present volume is a welcome contribution to our knowledge of this out-of-the-way corner of France. The author, who here describes his three months' tramp, has evidently made the most of his time in seeing the principal mountains and valleys, and in obtaining all the information he could regarding the country and people. There are chapters descriptive of Metz and its surroundings, Strassburg, the Zorn and the "Goethe Country," the Druids' Mountain, the banks of the Leber, Colmar and Münster, Mülhausen, Gérardmer, &c., besides others dealing with Vosgien Song, Legend and Customs, Vosgien Spas, the valley of the Meurthe, and the Forêt de Saint Quirin. The volume will be of great service to any one contemplating a similar tour.

ASIA.

Black, Charles, E. D.—A Memoir on the Indian Surveys, 1875–1890. Printed and Published by order of the Secretary of State for India in Council. London, Constable, 1891: imp. 8vo., pp. vi. and 412. Price 7s. 6d. [Presented by the Secretary of State for India.]

The original "Memoir on the Indian Surveys" was written by Mr. C. R. Markham, C.B., in 1871. It dealt with all the geographical and scientific side of Indian history from the earliest period and traced the gradual development of the present "Survey Department" in its various phases of triangulation, topography, revenue surveys, coast surveys, geographical exploration, as well as the kindred subjects of geological, meteorological, geodetic, and archaeological investigations. A second edition of Mr. Markham's book, published in 1878, brought the story up to 1875, and the volume now published by the India Office completes the review of the operations up to 1890. Mr. Markham's idea was that his "Memoir" should be followed by annual "abstracts" of the reports received from India, and this plan was followed out for a time, but for the last twelve years these "abstracts" have been discontinued, so the appearance of Mr. C. E. D. Black's volume is doubly welcome. Much of interest from a geographical point of view has taken place during the past fifteen years. The principal triangulation has been brought to a close on to a carefully measured base of verification in Mergui, though it is only fair to add that this has since been followed by the annexation of new provinces (viz. Upper Burma and Baluchistan) where plenty of fresh work still awaits the trigonometrical parties. In the matter of coast charts, Indian surveyors have been busy since the establishment of the Marine Survey Department in 1875, and numerous ports and anchorages formerly unknown to map-makers have been carefully charted. We may point out in connection with this that a list of the Indian coast charts would form a trifling but very useful addition to the present work, if a second edition thereof should be in contemplation; also in such an event, the chapter on Trans-frontier Explorations might with advantage be enlarged. Probably the present rules as to the wholesale suppression of trans-frontier surveys and reports has been a stumbling block, but we are not without hopes that a reform may be soon inaugurated, and in that case a good deal of the very interesting information collected in and about Afghanistan during the last ten years ought to be judiciously collated and incorporated. The geographical chapters of Mr. Black's volume contain much important matter, such as the travels of A—K, M—S, R—N, and the numerous other anonymous pundits of the Survey, as well as the travels of Mr. Ney Elias, of the officers in the Afghan war, and of the British and Native Staff attached to the Anglo-Russian Commission. It will be a great convenience for geographers for these numerous detached surveys to be brought together into one focus. The chapter on Indian Archaeology deals exhaustively with the surveys of General Sir A. Cunningham and Dr. Burgess, and a galaxy of minor names. In this domain too special activity has prevailed during the last twenty years, and the numerous references to the detailed reports and volumes produced will prove useful to students. Altogether Mr. Black's volume will prove acceptable to geographers, and its attractiveness will be enhanced by the satisfactory manner in which it has been printed as well as by a picturesque reproduction of one of Colonel Tanner's most striking Himalayan views, and a good index.

Clutterbuck, Walter J.—About Ceylon and Borneo, being an account of Two Visits to Ceylon, one to Borneo, and how we fell out on our Homeward Journey. London, Longmans & Co., 1891: cr. 8vo., pp. x. and 265, maps and illustrations. Price 10s. 6d. [Presented by the Publishers.]

This volume is written by the joint author of "Three in Norway," and after the same style. It contains very little new geographical information.

Cuinet, Victor.—La Turquie d'Asie. Géographie administrative, statistique, descriptive et raisonnée de chaque province de l'Asie Mineure. Paris, Ernest Leroux, 1891. Tome premier. Fascicules 1 and 2.

This work is more statistical than geographical. The plan adopted has been to take each province, or *vilayet*, of Asia Minor separately, and to describe, with more or less detail, the administrative divisions, the people and their manners and customs, the schools, exports, imports, products and industries, agriculture, live stock, revenue, roads, rivers, mountains, mines, forests, *salines*, &c. The vilayets described in the first volume are:—Tribizond, Erzerum, Angora, Crete, and the Archipelago. Much valuable information is given in a convenient form; but on some points the details are needlessly minute, and the plan adopted necessitates a certain amount of useless repetition.

There is a general map showing the Administrative Divisions of Turkey in Asia, scale 1:1,000,000; and there are also special maps of the vilayets, on which are shown the boundaries of the Sanjaks and Kazas, the forests, main roads, &c., &c.

[Murray's Handbooks.]—A Handbook for Travellers in Japan. Third edition. By Basil Hall Chamberlain and W. B. Mason. With fifteen maps. London, John Murray, 1891: post 8vo., pp. ix. and 459. Price 15s.

The present edition of the Handbook for Japan has been thoroughly revised, and, it is stated, for the most part re-written. Certain portions of the original 'Handbook for Central and Northern Japan' by Mr. E. Satow, C.M.G., and Lieut. A. G. S. Hawes, have been incorporated, while those divisions of the country which in previous editions were left untouched are now treated of for the first time. Sectional maps of the whole Empire have been added, together with more detailed maps of such favourite neighbourhoods as Yokohama, Kyōto, Nikkō, &c. All the maps, it is stated, have been specially prepared for the present edition at the Seizu-Gwaisha in Tōkyō, on the basis of those now in course of publication by the Geological Bureau of the Imperial Japanese Department of Agriculture and Commerce.

AFRICA.

Monteiro, Rose.—Delagoa Bay, its Natives and Natural History. London, G. Philip & Son, 1891: cr. 8vo., pp. xi. and 274. Price 9s. [Presented by the Publishers.]

Mrs. Monteiro has here produced a very readable account of her experiences during her residence at Delagoa Bay. Her chief pursuit was the collecting of objects of natural history, and from this point of view her volume is of great original value. Having lived among the people, too, for some considerable time, many opportunities were afforded her of gaining an insight into their inner life—their mode of living, habits, and customs, so that the volume will also be of interest to the ethnologist. In describing the town of Lourenço Marques, Mrs. Monteiro is inclined to paint it at its best, and endeavours to defend the place against the bad name it has hitherto borne with regard to its climate. The volume contains twenty original illustrations after the author's sketches, and from the natural objects by A. B. and E. C. Woodward.

Verneau, [Dr.] R.—Cinq Années de Séjour aux Iles Canaries. Paris: A. Hennuyer, 1891: 8vo., pp. xvi. and 412. Price 9s.

The author here embodies the results of his five years' observations while engaged on a scientific mission to the Canaries. He gives a very full and complete account of the group under a variety of aspects—historical, ethnological, descriptive, industrial, &c. After a historical introduction the volume is divided into two parts. The first part treats of the ancient inhabitants, containing some interesting details regarding their physical character, social organisation, food and habitations, industry, religion, and intellectual character.

Part II. deals with the Canaries at the present time, and commences with a chapter on the geography of the archipelago, followed by others describing each island of the group separately. Chapter xx. treats of the productions and commerce, and the volume concluding with some pathological and climatological considerations. The illustrations of people and places are of special interest. A map is also given.

Wingate, [Major] F. R. [D.S.O., R.A.]—Mahdiism and the Egyptian Sudan, being an Account of the Rise and Progress of Mahdiism, and of subsequent events in the Sudan to the Present Time. With 30 maps and plans. London, Macmillan & Co., 1891: 8vo., pp. xxviii. and 617. Price 30s. [Presented by the Publishers.]

Major Wingate, from his position as Head of the Intelligence Department in Cairo, has had special opportunities of obtaining full information on the remarkable series of movements in the Sudan in recent years which may be classed under Mahdiism, and which, among other misfortunes, has been the means of stopping explorations in the Upper Nile regions. The work may indeed be regarded as an official publication, and Major Wingate confines himself almost exclusively to a statement of facts. The full details of evidence with respect to the capture of Khartoum and the death of Gordon will be read with interest. The narratives of the various expeditions up the Nile and elsewhere, combined with the ample supply of excellent maps, render the work of some geographical value.

AMERICA.

Branner, J. C.—The *Æolian Sandstones of Fernando de Noronha*. [From the 'American Journal of Science,' vol. xxxix., April 1890.] 8vo., illustrations.

[**Brazil.**]—*Boletim da Commissão Geographica e Geologica da Provincia de S. Paulo*, Nos. 1-7. S. Paulo, L. K. Bookwalter, 1889-90: 8vo., pp. (No. 1) 26; (No. 2) 39; (No. 3) 24, diagrams; (No. 4) 73; (No. 5) 51; (No. 6) 40, map and diagrams; (No. 7) 40.

No. 1—Historical retrospect of the geographical and geological work effected in the province of S. Paulo, by Orville A. Derby; No. 2—Geological reconnaissance of the Valley of the Rio Paranapanema, by F. De Paula Oliveira; No. 3—Climatological Data of the years 1887 and 1888, by Alberto Lœfgren; No. 4—Geographical and economical considerations upon the Valley of the Rio Paranapanema, by Theodoro Sampaio; No. 5—Contributions to the Botany of S. Paulo—Memoir of the Botanical Excursions of 1887, 1888 and 1889; No. 6—Climatological data of the year 1889, by Alberto Lœfgren; No. 7—Mineralogical and Petrographical contributions, by E. Hussak, Ph.D.

Broke, George.—With Sack and Stock in Alaska. London, Longmans & Co., 1891: 12mo., pp. xi. and 158. Price 5s. [Presented by the Publishers.]

The author accompanied Mr. Topham to Alaska, and the present volume may be regarded as supplementing the latter's paper published in the 'Proceedings' for 1889, at p. 424. There are two maps—one showing the coast of part of South-eastern Alaska, the other of the southern slopes of Mount St. Elias, both of which show the author's routes.

Dawson, [Sir] J. William.—The Geology of Nova Scotia, New Brunswick, and Prince Edward Island, or Acadian Geology. Fourth edition. London, Macmillan & Co., 1891: 8vo., pp. xxvi., 694, 102, and 37. Map and illustrations. [Presented by the Publishers.]

Although mainly of geological interest, the student of physical geography will find much in the present work that he will do well to consult. From the preface to the first edition of this work we learn that its original intention was "to place within the reach of the people of the districts to which it relates, a popular account of the more recent discoveries in the geology and mineral resources of their country, and at the same time to give to geologists in other

countries a connected view of the structure of a very interesting portion of the American continent, in its relation to general and theoretical geology." As in the case of the previous edition, issued twelve years ago, the author, in order to bring the present edition up to date, has appended a further supplement, indicating what has been done in the interval, and containing some necessary corrections. Great care has apparently been bestowed upon the construction of the map, which adds greatly to the value of the work.

Hugues, Luigi.—Di alcuni recenti giudizi intorno ad Amerigo Vespucci. Osservazioni critiche. Torino, E. Loescher, 1891: 12mo., pp. 79. [Presented by the Author.]

Latzina F.—Diccionario Geográfico Argentino. Buenos Aires, 1891: imp. 8vo., pp. x. and 619. [Presented by the Author.]

Morant, G. C.—Chili and the River Plate in 1891. Reminiscences of Travel in South America. London, Waterlow & Sons, 1891: 12mo., pp. 268, illustrations. Price 3s. 6d. [Presented by the Author.]

The author, an intelligent observer, here narrates his experiences in Chili and the River Plate Republic in the early part of the present year. His chapters describe such places as Buenos Ayres, La Plata, Monte Video, Valparaiso and Santiago, Lima, &c., with notes on the people, their customs, &c. There are also chapters dealing with the Argentine financial crisis and the Chilean revolution. Altogether the volume gives a good idea of the present condition of things in Chili and the River Plate.

Rink, [Dr.] H.—The Eskimo Tribes. Their Distribution and Characteristics, especially in regard to Language. With a Comparative Vocabulary, and a Sketch-map. With supplement (vols. i. and ii.), 1887-91. Copenhagen, C. A. Reitzel; and London, Longmans & Co., 1891: 8vo., pp. (vol. i.) 163; (vol. ii.) 124; plate. [Presented by the Author.]

This work forms vol. xi. of the 'Meddelelser om Grønland,' edited by the Commission for Directing the Geological and Geographical Explorations in Greenland. It consists of two volumes bound in one, the second volume acting as a supplement. Vol. i. is divided into three sections as follows:—1. The Eskimo Tribes, their common origin, their dispersion, and their diversities in general; 2. The Eskimo Language, its admirable organisation as to the construction and flexion of words; 3. Comparative List of the Stem-words or independent Stems of the Eskimo Dialects, with examples of their derivatives. Vol. ii. The Origin of the Eskimo, as traced by their language; Comparative Vocabulary. Under these headings Dr. Rink, who is probably the best living authority on his subject, has brought together a deal of information bearing on the question of the origin of the Eskimo and their migrations, which will be of great value both from the ethnological as also the linguistic point of view. After a careful examination of the mode of life, the customs and usages of the Eskimo, and more especially their language, the chief result arrived at is a theory according to which their ancestors originally inhabited a territory situated somewhere in the interior of the North American continent, whence they emigrated, and, following the watercourses, were led to a littoral of the Arctic or Subarctic regions, most probably that of Alaska. Settled on the shores of that country, they developed their wonderful art of capturing marine animals, which culminated in their marvellous capability of facing even the most terrible experiences of the Arctic clime. From Alaska they then should have emigrated, spreading gradually to the east and north over the vast regions since tenanted by them.

In dealing with the distribution and division of the Eskimo Dr. Rink divides them up as follows:—1. The Western Eskimo, comprising (a) the Southern Tribes, numbering about 8300 souls; (b) the Northern Tribes, rated at 2900; (c) the Asiatic Eskimo, whose number is very doubtful, but by Krause believed not to exceed 2000. 2. The Mackenzie Eskimo, or Tchiglit, separated from the Western by an uninhabited coast-line of 300 miles, num-

bering 2000 souls. 3. The Tribes of the Central Regions, which begin at Cape Bathurst, number possibly 4000. 4. The Labradorians, amounting to between 2000 and 2200. 5. The Greenlanders, divided in East and West Greenland. In 1880 the West Greenlanders amounted to 9752, all of whom were Christianised. In 1884 the East Greenlanders south of 68° N. lat. numbered 548.

AUSTRALASIA.

Mannering, G. E.—With Axe and Rope in the New Zealand Alps. London, Longmans & Co., 1891: 140 pp., maps and illustrations. Price 12s. 6d.

This is a spirited account of some very spirited mountain adventure and exploration in the Southern Alps undertaken by a party of young colonists, who, inspired by the example of Mr. Green, sent to Switzerland for the necessary implements and set to work to teach themselves "mountaineering." A capital map of the great glaciers round "Mount Cook," based mainly on the recent Government surveys of Mr. T. N. Brodrick, and many good illustrations from photographs add to the value of the volume. The extensive moraines of the eastern glaciers are accounted for by the long distance for which they flow under steep slopes of very friable rock, and need no further explanation. The best route to the ridge of Aorangi—as we rejoice to see "Mount Cook" is now again called—has perhaps not yet been discovered. The saddle at the head of the Hooker Glacier may prove worth a trial. In the point of surveying left in contest between Mr. Green and Dr. von Lendenfeld, Mr. Green is proved right. Mr. Mannering adds a very useful summary of the work of his predecessors up to date, and the good news that a New Zealand Alpine Club is being formed. It should give its attention to establishing bases of exploration on the west coast and making passes over the chain.—[D. W. F.]

OCEANIA.

Tregear, Edward.—The Maori-Polynesian Comparative Dictionary. Wellington, Lyon & Blair, 1891: large 8vo., pp. xxiv. and 675. [Presented by the Author.]

GENERAL.

Faure, C.—Les progrès de l'Enseignement de la Géographie en France. Communication présentée à la VIII^e Assemblée générale de l'Association des Sociétés Suisses de Géographie à Neuchâtel, le 17 septembre 1890. Neuchâtel, 1891: 8vo., pp. 32. [Presented by the Author.]

Hedger, [Capt.] Thomas.—On Sea and Shore. An Autobiography. Hull, M. C. Peck & Son, 1891: 12mo., pp. 266, portrait. [Presented by the Author.]

Pennesi, Giuseppe.—Pietro Della Valle e i suoi viaggi in Turchia, Persia e India. Roma, 1890: 8vo., pp. 63, map. [Presented by the Author.]

Wagner, Hermann.—Ueber das von S. Günther 1888 herausgegebene spätmittelalterliche Verzeichnis geographischer Koordinatenwerte. Göttingen, 1891: 8vo. [Presented by the Author.]

Wilde, Henry.—On the Causes of the Phenomena of Terrestrial Magnetism, and on some Electro-Mechanism for exhibiting the Secular Changes in its Horizontal and Vertical Components.—Sur les causes des Phénomènes du Magnétisme Terrestre, et sur un Appareil Electro-Magnétique qui reproduit les variations séculaires des composantes Horizontales et Verticales. 4to., pp. 39 and 41, plates. [Presented by the Author.]

The following works have also been added to the Library:—

Caillié, René.—Journal d'un Voyage à Tombouctou et à Jenné, dans l'Afrique Centrale, précédé d'Observations faites chez les Maures Braknas, les Nalous et

d'autres peuples; pendant les années 1824, 1825, 1826, 1827, 1828. Avec une Carte Itinéraire, et des remarques géographiques, par M. Jomard. 3 vols., Paris, 1830: 8vo., pp. (vol. i.) xii. and 475; (vol. ii.) 426; (vol. iii.) 404.

Ritter, Carl.—Die Erdkunde im Verhältniss zur Natur und zur Geschichte des Menschen, oder allgemeine, vergleichende Geographie, als sichere Grundlage des Studiums und Unterrichts in physikalischen und historischen Wissenschaften. Parts i. and ii. Berlin, G. Reimer, 1817–18: 8vo., pp. (part i.) xx. and 832; (part ii.) xviii. and 939. [Presented by Dr. H. Schlichter.]

[**Wertomannus, Lewis.**—The Navigation and Vyages of Lewis Wertomannus, Gentelman of the Citie of Rome, to the Regions of Arabia, Egypte, Persia, Syria, Ethiopia, and East India, both within and without the Ryuer of Ganges, etc. In the yeere of our Lorde 1503. Conteyning many notable and straunge thinges, both Hystorical and Naturall. Translated out of Latine into Englyshe, by Richarde Eden, in the Yeere of our Lord 1576. [Privately printed for the Aungervyle Society, Edinburgh, 1884.] 8vo., pp. 280. [Presented by Sir Frederic Goldsmid.]

NEW MAPS.

(By J. COLES, *Map Curator* R.G.S.)

EUROPE.

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— Artaria's Special Touristen-Karte Nr. 4. Dachstein-Gruppe mit Distanz-Uebersichtskarte. Scale 1:50,000 or 1·4 inches to a geographical mile. Für Touristen bearbeitet von Gustav Freytag. Mit Beiträgen von H. Hess. Verlag und Eigenthum von Artaria & Co., Wien, 1891. Price 2s. 4d. [Presented by the Publishers.]

Danmark.—Generalstabens topografiske Kaart over —. Scale 1:40,000 or 1·8 inches to a geographical mile. Sheets: "Povbjerb," "Giver," "Lemvig."

Kalkograferet og graveret ved generalstaben, Kjöbenhavn, 1890. [Presented by the Danish Government through H.E. the Danish Minister.]

Deutschen Reiches.—Karte des —. Scale 1:100,000 or 1·3 geographical miles to an inch. Sheets: 278, Mogilno; 301, Posen; 302, Wreschen; 349, Gostyn; 350, Koshmin. Herausgegeben von der Kartogr. Abtheilung der Königl. Preuss. Landes-Aufnahme, 1891. Price 1s. 6d. each. (*Dulau, Agent.*)

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ASIA.

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AFRICA.

Afrika.—Spezial-Karte von —, im Massstab von 1:4,000,000 or 55·5 geographical miles to an inch. (10 Blatt) entworfen von Hermann Habenicht, bearbeitet von demselben, Bruno Domann und Dr. Richard Lüddecke. Dritte Auflage. Gotha, Justus Perthes, 1891. I. Lieferung. Price 3s. (*Dulau*.)

This is the first issue of the third edition of Habenicht's 'Special-Karte von Afrika.' It consists of two sheets, sections 5 and 6, the former including Central-Sudan, and the latter Abyssinia. With the accompanying letterpress,

in which all the authorities consulted in the revision of the sheets are mentioned, is an index on which is shown by a red tint all the portions of the map which have been entirely redrawn in order to bring it up to date. The map will be completed in five parts, which will no doubt be issued with the same regularity which was a distinguishing feature in the publication of the former editions.

Algérie.—Carte topographique de l' —. Scale 1:50,000 or 1·4 inches to a geographical mile. Dressé, gravé et publié par le Service géographique de l'Armée. Paris. Sheets 34, Mondovi; 35, Le Tarf; 212, Mascara. Price 1s. each. (*Dulaud.*)

Tunisie.—Carte topographique de la —. Scale 1:50,000 or 1·4 inches to a geographical mile. Dressé, gravé et publié par le Service géographique de l'Armée. Paris. Sheet XXXVII. Hammamet. Price 1s. (*Dulaud.*)

CHARTS.

Admiralty.—Charts and Plans published by the Hydrographic Department, Admiralty, during September and October 1891. [Presented by the Admiralty through the Hydrographer.]

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(*J. D. Potter, Agent.*)

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1811	Chale point to Kwyhu bay	New chart, Melinda to Juba .. 848
1759	Wen Chau bay to Kweshan islands	New chart, Wen Chau bay to Kweshan islands 1759
2352	Cape Flattery to Cape Sidmouth	New charts, Claremont point to Cape Direction 2921
2353	Cape Sidmouth to Cape Grenville	Cape Direction to Cape Grenville 2920

CHARTS THAT HAVE RECEIVED IMPORTANT CORRECTIONS.

No. 1753, Ireland, east coast:—Belfast lough. 2296, Gulf of Bothnia:—South Quarken to Hornslandet. 92, Spain, west coast:—Cape St. Vincent to Gibraltar Strait. 182, Mediterranean, east coast of Sicily:—Syracuse harbour. 71A, Bay of Bengal, Coromandel coast:—From latitude 16° 30' N. to latitude 18° 5' N. 1425, Bay of Bengal, Orissa coast:—Gopalpur to False point. 1008, Cochin China:—Kamrank to Vung Ro.

(*J. D. Potter, Agent.*)

North Atlantic Ocean.—Pilot Chart of the ———. November, 1891. With a supplement giving 'Late Reports of the Use of Oil to Prevent Heavy Seas from Breaking on Board Vessels.' Published at the Hydrographic Office, Navy Department, Washington, D.C. Richardson Clover, Lieut.-Commander, U.S.N. Hydrographer. [Presented by the U.S. Hydrographic Office.]

ATLASES.

Arabian Sea.—Daily Weather Charts for the period of Six weeks ending June 25th, 1885, to illustrate the Tracks of Two Cyclones in the Arabian Sea. Published by the Authority of the Meteorological Council. London: Printed for Her Majesty's Stationery Office, by Eyre and Spottiswoode, 1891. Price 10s. [Presented by the Meteorological Office.]

This series of charts has been compiled to show the progress of two cyclonic storms which passed over the Arabian Sea in the latter half of May and the first half of June 1885. No less than 239 ships' logs have been used in the preparation of the charts, and a brief account of each cyclone is given in the introduction.

Indian Ocean.—Meteorological Charts of the Portion of the ——— adjacent to Cape Guardafui and Ras Hafún. Published by the Authority of the Meteorological Council. London: Printed for Her Majesty's Stationery Office, by Eyre & Spottiswoode, 1891. Price 6s. [Presented by the Meteorological Office.]

In the preface to this atlas it is stated that in consequence of the numerous maritime disasters which have occurred between Ras Hafún and Cape Guardafui an idea was mooted by some experienced captains in the mercantile marine, that the change in the sea temperature could be trusted to indicate the position of the ship in latitude, the advocates of this test holding that a sea temperature of 80° Fahr., was never found, during the south-west monsoon, south of Cape Guardafui. As an investigation of these statements would prove of great service to the mariner, the Meteorological Council instructed Mr. Baillie, Marine Superintendent, to thoroughly test the question, and the charts published in this atlas are the outcome of the inquiry made by that gentleman.

The atlas contains twelve principal charts, one for each month. The area dealt with extends in longitude from the coast to 53° E., and from latitude 10° N. to 12° 20' N., thus including all the coast from Cape Guardafui to Ras Hafún. On each of these charts the sea surface temperature, direction of the wind and its force, the currents, their direction and rate, sea disturbance, mist, and depth of water, are clearly shown by a well-devised, and easily understood system.

At the end of the atlas there are twelve small abstract charts of sea temperature, wind, and current off Cape Guardafui, with explanatory notes on the system of colouring, and symbols employed.

Indischer Ozean.—Ein Atlas von 35 Karten, die physikalischen Verhältnisse und die Verkehrs-strassen darstellend. Mit einer erläuternden Einleitung und als Beilage zum Segelhandbuch für den Indischen Ozean. Herausgegeben von der Direktion. Deutsche Seewarte. Hamburg, L. Friederichsen & Co., 1891. Price 18s. (*Williams & Norgate*).

In this atlas all the physical features and meteorology of the Indian Ocean are dealt with in the most thorough manner. It contains 35 well-executed charts, and is furnished with five pages of explanatory letterpress.

Johnston, W. and A. K.—Royal Atlas of Modern Geography. Edition in monthly parts. Part I. W. and A. K. Johnston, Edinburgh and London, 1891. Price 4s. 6d. each part. [Presented by the Publishers.]

It has been the custom of the firm that publish this atlas to keep the sheets under a system of constant revision, and at stated times to issue a new edition

of the work. This system had certain disadvantages, and they have now decided to issue the corrected sheets in monthly parts. The style of cartography which was adopted in the original edition was remarkably effective, and has in the present instance been adhered to. As in other atlases which are issued monthly, the sheets will not be published in the order which they are to occupy in the completed work, but each will appear as the work of revision is completed. The present part contains the southern half of the two-sheet map of England and Wales, with insets of London and the Scilly Islands; and France, with insets of France in Provinces, environs of Paris, Corsica, and part of the Riviera from Mentone to Cannes.

Mercator, Gerhard.—Drei Karten von —. Europa—Britische Inseln—Weltkarte. Facsimile-Lichtdruck nach den Originalen der Stadtbibliothek zu Breslau. Hergestellt von der Reichsdruckerei. Herausgegeben von der Gesellschaft für Erdkunde zu Berlin. 41 Tafeln. Berlin, W. H. Köhl; London, Sampson Low & Co., 1891. Price 3*l*.

Until lately it had been supposed that only one original copy of Mercator's map of the world of 1569 existed, but Dr. Alfons Heyer in arranging the collection of maps in the city library of Breslau, discovered a second copy of it, and in addition to this, two other maps of the sixteenth century by the same author, viz. Europe and the British Isles. Facsimiles of these three maps have been produced by photography, and published by the Geographical Society of Berlin, to whom the thanks of all interested in the early development of cartography are due for placing within their reach these interesting documents.

Universal Atlas.—The —, complete in 28 parts, including Index. London, published by Cassell & Co., Limited, for the Atlas Publishing Company, Limited. Part 8. Price 1*s*. [Presented by the Publishers.]

Sheets 1 and 2 contain star maps, maps of the moon, and astronomical diagrams; they are all well drawn, the map of the moon being an excellent one, and sufficiently large for ordinary purposes of reference. Sheet 63 is a map of Southern Scandinavia, with an inset plan of Stockholm and its neighbourhood. Sheet 66 is a general map of Norway and Sweden, including Eastern Finland.

PHOTOGRAPHS.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

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